ASE
Andrews Survey & Engineering, Inc.
Land Surveying - Civil Engineering - Site Planning

SPECIAL PERMIT APPLICATION & SITE PLAN REVIEW

PURSUANT TO FRANKLIN ZONING BYLAWS
§185-Attachment 4—Use Regulations, 3.14c
§185-3 - Site Plan Review

Proposed Large-Scale Ground Mounted Solar Energy System
Off Spring Street
Franklin, MA

November 21, 2018

Franklin Assessors Map/Lot:
323/044, 310/002, 309/015

Zoning District:
Rural Residential I

Applicant:
Spring Street Renewables, LLC
101 Summer St, 2nd Floor
Boston, MA 02110

Representative:
Andrews Survey & Engineering, Inc.
104 Mendon Street
Uxbridge, MA 01569

ASE JN: 2018-101

Uxbridge
104 Mendon Street
Uxbridge, MA 01569
Tel. 508 278-3897 Fax. 508 278-2289

North Attleboro
500 East Washington Street
North Attleboro, MA 02760
Tel. 508 316-0452 Fax. 508 316-0963

www.andrews-engineering.com

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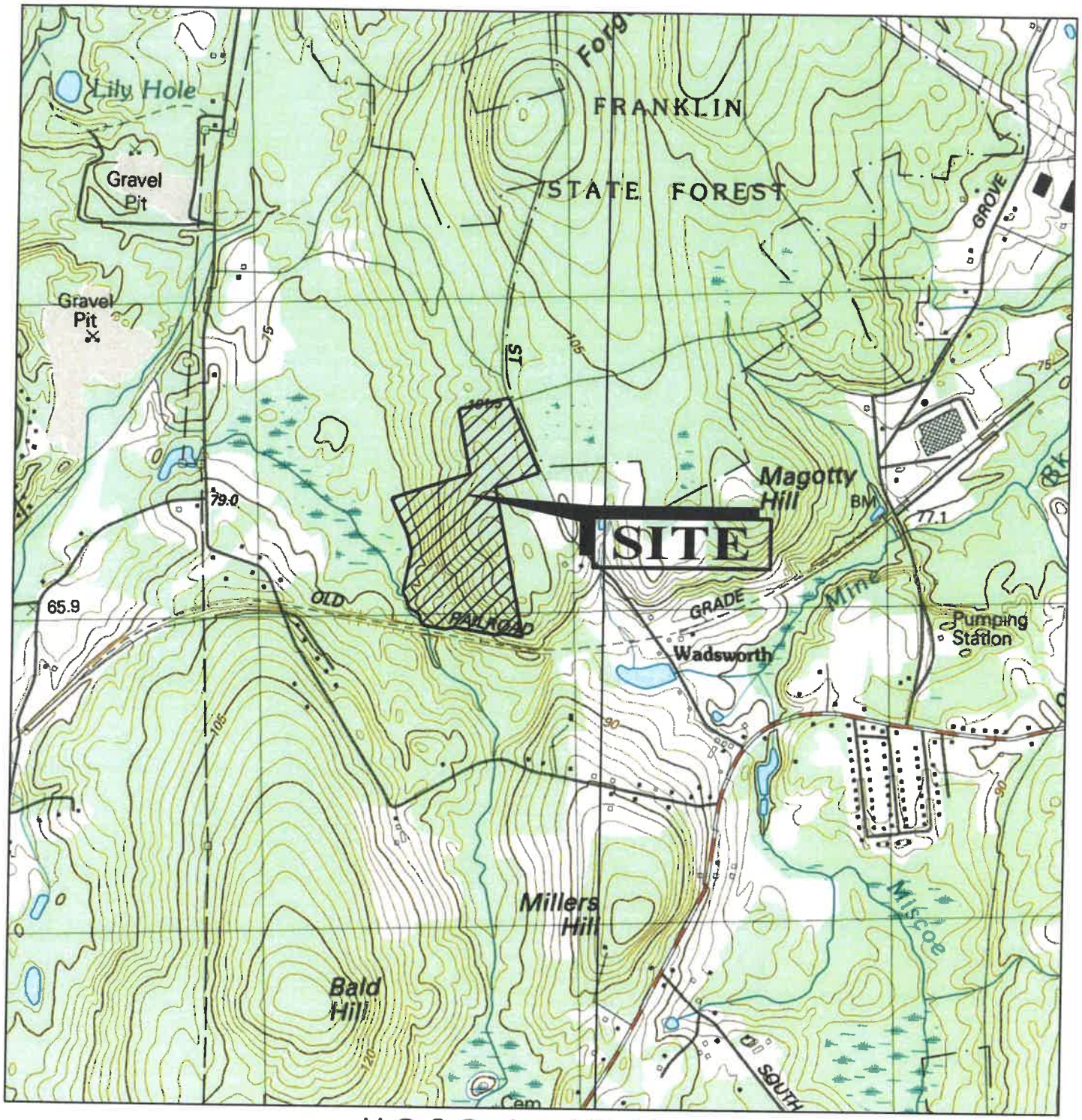


U.S.G.S. LOCUS MAP

SCALE: 1"=1500'

LARGE CAPACITY GROUND MOUNTED PV SYSTEM
SPRING STREET
FRANKLIN, MASSACHUSETTS

ASE

Andrews Survey & Engineering, Inc.
Land Surveying - Civil Engineering - Site Planning

P.O. Box 312, 104 Mendon Street
Uxbridge, Massachusetts 01569-0312
P: 508-278-3897 F: 508-278-2289

N

FIGURE 1.0

Memorandum In Support of Special Permit Application

COMMONWEALTH OF MASSACHUSETTS
TOWN OF FRANKLIN
PLANNING BOARD

NORFOLK, ss.

IN RE: SPECIAL PERMIT TO ALLOW FOR A LARGE SCALE GROUND MOUNTED SOLAR ENERGY SYSTEM WITHIN THE RURAL RESIDENTIAL I ZONING DISTRICT
LOCUS: Spring Street, Franklin, Massachusetts 02038

MEMORANDUM IN SUPPORT OF APPLICATION FOR SPECIAL PERMIT TO ALLOW FOR A LARGE SCALE GROUND MOUNTED SOLAR ENERGY SYSTEM WITHIN THE RURAL RESIDENTIAL I ZONING DISTRICT

LOCUS HISTORY

1. **Relevant District.** The Locus is located wholly within the Rural Residential I (RRI) zoning district.

2. **Location.** The Locus consists of a compilation of three parcels of land held in separate ownership, in the aggregate totaling approximately 48.6 acres (Franklin Assessor Map 309-015-000; 310-002-000; 323-044-000), located along the westerly side of Spring Street in Franklin, Massachusetts. According to the records of the Clerk of the Town of Franklin, Spring Street is a public way which proceeds south from West Central Street to Washington Street, accepted by the Town of Franklin prior to 1870 and named by the Town at the Annual March meeting adjourned to April 4, 1870. The Locus is bounded to the north and east by undeveloped land comprising the state forest, and by an undeveloped and wooded portion of Spring Street, to the south by property owned by the Southern N.E. Turnpike Trail, and to the west by undeveloped wooded land. The Locus is undeveloped containing wooded and shrub swamp areas, and a stream running through the southwest quadrant of the Locus (said subject property is collectively referred to herein as the "Locus").

3. **Current Use/Permitting History.** The Locus is currently undeveloped.

4. **Proposed Use/Construction.** The petitioner proposes the construction of a ±6 MW DC ground-mounted solar energy system which includes approximately 25 acres of ground mounted solar modules, a 800 square foot utility structure for battery storage, approximately 4,900 linear feet of security fencing surrounding the perimeter of the developed site, a gravel parking and driveway area to accommodate service and emergency vehicle access and the on site parking of 16 motor vehicles for the public regarding recreational uses in the area.

The proposed development also anticipates construction upgrades along 1,150 linear feet of Spring Street (a public way) to establish gravel access for service and emergency vehicles, as well as the installation of six (6) utility poles to provide overhead utility access to the developed site. Also planned for the development would be the introduction of a contemporary storemwater management drainage system serving the Locus designed to attenuate and mitigate peak flows up to and including the 100-year storm event in compliance with the Wetlands Protection Act which would include appropriate treatment of post construction storm water runoff and storm water recharge, along with associated contemporary landscaping all as shown on the site plan entitled, "Site Development Plans " prepared by Andrews Engineering, Inc., (the "Plan") a copy of which has been filed along herewith.

5. Zoning Tabulation CBD District: Rural Residential I - Required/Proposed.

OVERALL LOT INFORMATION	Required	Proposed
Required Lot Area (sq.ft.)	40,000 s.f.	48.6 acres ±
Required Lot Frontage (feet)	200.00'	960 ft.±
Max. Lot Coverage by Structures/Paving	25%	<1 %
Max Building Height	3 stories/35'**	12 ft
Lot Width	180.00'	> 2,000 ft
Lot Depth	200.00'	> 1,000 ft
Front Setback	40.00'	470 ft. +/-
Side Setback	40.00'*	75 ft and 150 ft
Rear Setback	40.00'*	145 ft.
Parking (spaces)	0	None for solar

*No accessory ground-mounted solar energy systems on parcels within or adjacent to residential Zoning Districts shall be located in any side or rear yard area nearer to the lot line than 20 feet pursuant to §185-19E2.

**No accessory ground-mounted solar energy system shall be more than 15 feet in height, measured from the common grade pursuant to §185-19E3.

PRESENT PETITIONER/APPLICATION

6. Petitioner/Owner. The present petitioner is NEXAMP, INC., a Massachusetts corporation with a usual place of business at 101 Summer Street, Boston, Massachusetts 02910. The present owners of the various parcels that make up the Locus are as follows:

a. Tract I ~ (309-015-000) ~ Michael J. Bucci, an individual with a mailing address of 4 Almond

Drive, Johnston, Rhode Island 02919.

b. Tract II ~ (310-002-000) ~ Richard F. Costello, an individual with a mailing address of P.O. Box 283, Franklin, Massachusetts 02038.

c. Tract III ~ (323-044-000) ~ Anthony R. Depoto, Edward J. Depoto, Donna A. Brunelli and Richard J. Depoto, with a mailing address of 8 Spring Street, Franklin, Massachusetts 02038.

7. **Requested Action.** The present application before the Board requests approval of the following:

a. SPECIAL PERMIT under Attachment 4, Use Regulations Schedule, Part III, 3.14c of §185 of the Code of the Town of Franklin to allow for a Large Scale Ground Mounted Solar Energy System within the Rural Residential I zoning district as shown on the Plan.

8. **Local Permits and Approvals**. In addition to the aforementioned SPECIAL PERMITS, the petitioner has also received, or is contemporaneously seeking the following permits and approvals in connection with the present development proposal of the Locus:

a. Notice of Intent filed seeking an Order of Conditions from the Franklin Conservation Commission.

SPECIAL PERMIT APPROVAL

9. **Special Permit Approval Requirements under Section 185-45(E)(3).** Section 185 45(E)(3) of the Zoning By-Laws, states in part:

Findings. Special permits shall be granted by the special permit granting authority only upon its written determination that the proposed use will not have adverse effects which overbalance its beneficial effects on either the neighborhood or the Town, in view of the particular characteristics of the site and of the proposal in relation to that site. The determination shall be in addition to the following: ***[Amended 3-25-1987 by Bylaw Amendment 87-91; 3-21-2012 by Bylaw Amendment 12-669]***

(a) Proposed project addresses or is consistent with neighborhood or Town need.
(b) Vehicle traffic flow, access and parking and pedestrian safety are properly addressed.
(c) Public roadways, drainage, utilities and other infrastructure are adequate or will be upgraded to accommodate development.
(d) Neighborhood character and social structure will not be negatively impacted.
(e) Project will not destroy or cause substantial damage to any environmentally significant natural

resource, habitat, or feature or, if it will, proposed mitigation, remediation, replication, or compensatory measures are adequate.
(f) Number, height, bulk, location and siting of building(s) and structure(s) will not result in abutting properties being deprived of light or fresh air circulation or being exposed to flooding or subjected to excessive noise, odor, light, vibrations, or airborne particulates.
(g) Water consumption and sewer use, taking into consideration current and projected future local water supply and demand and wastewater treatment capacity, will not be excessive.

CONDITIONS FOR APPROVAL UNDER SECTION 185-45(E)(3)

10. Satisfaction of Condition for Approval 185-45(E)(3)(a).

***(a)* Proposed project addresses or is consistent with neighborhood or Town need.**

Solar energy harnessed through the use of solar energy panels is a renewable energy source without the ancillary deleterious impacts found with many forms of carbon based energy generation. Local communities that sponsor or participate with such renewable sources of energy such as solar energy generation receive improved electrical infrastructure and potentially will experience savings in electricity bills via the Community Solar program. The associated improvements to Spring Street, including the gravel parking area being proposed for public use, would afford greater public access for active and passive use of the adjacent areas of the state forest located north and east of the Locus.

11. Satisfaction of Condition for Approval 185-45(E)(3)(b).

***(b)* Vehicle traffic flow, access and parking and pedestrian safety are properly addressed.**

The proposed development is to include a gravel access drive providing vehicular access from the developed site to Spring Street and Washington Street, a fully developed arterial roadway within the town of Franklin. Aside from establishing a gravel driveway, sixteen (16) feet in width, providing vehicle access to the northern, southern and eastern quadrants within the developed solar field, a gravel parking area to accommodate 16 motor vehicles is planned, which will include deeded easement rights to the town of Franklin so as to enhance public access and use of the adjacent areas of the state forest located north of the Locus. Once operational, the solar project will only generate 4 to 6 annual vehicle trips, essentially a zero traffic impact to the neighborhood.

12. Satisfaction of Condition for Approval 185-45(E)(3)(c).

***(c)* Public roadways, drainage, utilities and other infrastructure are adequate or will be upgraded**

to accommodate development.

The proposed development includes improvement measures to those undeveloped portions of the Spring Street right of way, including the clearing of trees, installation of gravel twenty (20) feet in width, with limited bituminous pavement fourteen (14) feet in width to certain designated areas which are characterized with a steeper grades exceeding 10% so as to avoid 'wash out', thereby providing safe access to the Locus for service and emergency vehicles, as well as access by the general public to the proposed parking easement area. The proposed development would include the installation of new utility poles along the Spring Street right of way, and an upgrade of existing utility poles along Washington Street. The Locus has no plans to access the public water service and sewer service, natural gas, and data services. Included with the proposed the development is a stormwater management system designed in compliance with the Massachusetts Stormwater Management Policy and the Town of Franklin Best Development Practices Guidebook to the maximum extent practicable. The proposed stormwater management system will reduce stormwater runoff peak flow rates and volumes, and improve runoff water quality. The stormwater management measures proposed for the development will have no adverse impacts to resource areas or adjacent properties. Runoff quantity will be reduced and water quality enhanced over existing conditions resulting in an overall benefit to the surrounding area. See Drainage Calculations and Stormwater Management Plan prepared by Andrews Engineering, Inc.

13. **Satisfaction of Condition for Approval 185-45(E)(3)(d).**

***(d)* Neighborhood character and social structure will not be negatively impacted.**

Vehicle access to the Locus will occur during the construction phase of the project which is anticipated to last approximately five to six months. Once completed, the proposed development of the Locus will not have any detrimental effect to the neighborhood character or social structure, as vehicle traffic generated by the site would be minimal. The rather remote location and natural topography of the Locus will prevent visual appearance of the solar panels by the general public.

14. **Satisfaction of Condition for Approval 185-45(E)(3)(e).**

(e) Project will not destroy or cause substantial damage to any environmentally significant natural resource, habitat, or feature or, if it will, proposed mitigation, remediation, replication, or compensatory measures are adequate.

The proposed development would result in limited clearing at the southern portion of the Locus. The proposed development will maintain water quality with an entirely vegetated Locus and a "meadow" environment along with the completion of a vegetative swale drainage system with stormwater detention basins and infiltration components to recharge storwater throughout. For areas outside of the fence, all tree stumps will remain to revegetate, initially creating a shrub/small tree environment, ultimately developing into a young forested area (20-30 ft). Also, a pollinator seed mix is proposed along the interior gravel drives surrounding the modules and laydown areas plus adding clover to the solar modules area further enhancing the pollinator environment. Overall, this "meadow" and "pollinator grass" environment will enhance and encourage ecological diversity for birds, invertebrates such as bees and butterflies and small mammals.

The stormwater management system has been designed to meet or exceed the requirements established in the Massachusetts Stormwater Handbook and by the Town of Franklin. According to the Drainage Calculations and Stormwater Management Plan prepared by Andrews Engineering, Inc., the proposed stormwater design will improve the existing conditions and have no adverse impacts to any resource areas. The drainage system is designed to meet the MA DEP stormwater management standards and will provide sufficient treatment of runoff. In addition to seeking approval of a special permit/site plan approval before the Planning Board, the petitioner shall also be contemporaneously seeking an order of conditions from the Franklin Conservation Commission for any construction activities within the delineated buffer zones of the stream located within the southwesterly portion of the Locus.

15. <u>Satisfaction of Condition for Approval 185-45(E)(3)(f)</u>.

(f) Number, height, bulk, location and siting of building(s) and structure(s) will not result in abutting properties being deprived of light or fresh air circulation or being exposed to flooding or subjected to excessive noise, odor, light, vibrations, or airborne particulates.

The proposed ground mounted solar energy field and associated ancillary building have been located on the Locus meeting, or in many instances exceeding, all minimum site distances, set back and height requirements of the town of Franklin Zoning Bylaw, and as such the proposed development will not result in abutting properties being deprived of light or fresh air circulation. Further, that abutting properties will not be exposed to flooding or subjected to excessive noise, odor, light, vibrations or airborne particulates. The petitioner has incorporated Best Management Practices (BMP's) to meet the Department of Environmental Protection Stormwater Management runoff quality requirements. The proposed drainage serving the proposed development has been designed to attenuate peak flows up to and including the 100-year storm event and

infiltrate after appropriate water quality pre-treatment, and shall handle the post construction storm water runoff and storm water recharge. Exterior lighting for the Locus is not proposed and will not generate any projection of light off of the premises.

16. Satisfaction of Condition for Approval 185-45(E)(3)(g).

***(g)* Water consumption and sewer use, taking into consideration current and projected future local water supply and demand and wastewater treatment capacity, will not be excessive.**

The town of Franklin water system pumps 3-4 million gallons of water each day. The estimated peak usage for the planned solar development use is zero. According to information and belief, the water demand for this proposed Locus will not negatively impact the pumping capacity to the Town's water system, and thus will not adversely affect the Town's water supply.

WHEREFORE, the Petitioner respectfully requests that the Board grant a SPECIAL PERMIT to Allow for a Large Scale Ground Mounted Solar Energy System within the Rural Residential I zoning district as shown on the Plan.

Dated: November 20, 2018

Respectfully submitted,
NEXAMP, INC.
By its Attorneys,

Richard R. Cornetta, Jr.

Richard R. Cornetta, Jr., Esquire
Cornetta, Ficco & Simmler, PC
Four West Street
Franklin, MA 02038
Tel: (508)528-5300
Fax: (508)528-5555
Email: richard@cornettalaw.com

Site Plan & Special Permit Application

APPLICATION FOR APPROVAL OF A SITE PLAN AND SPECIAL PERMIT(S)

To the Franklin Planning Board:

The undersigned, herewith, submits the accompanying Site Plan entitled "Large Capacity Ground Mounted Solar Energy System" and Special Permit(s) for Large Capacity Ground Mounted Solar Energy System and requests approval for under the provisions of the Zoning By-Laws of the Town of Franklin covering Site Plans and Special Permits.

1. Name of Applicant: Spring Street Renewables, LLC, Attn: Alan Clapp
   Address of Applicant: 101 Summer St, 2nd Floor, Boston, MA 02110
   Phone No.: 617-431-1440 Email: aclapp@nexamp.com

2. Name of Owner (if not the Applicant): See Attachment A
   Address of Owner: _____
   Phone No.: _____ Email: _____

3. Name of Engineer: Stephen J O'Connell Andrews Survey & Engineering, Inc.
   Address of Engineer: PO Box 312, Uxbridge, MA 01569
   Phone No.: 508-278-3897 Email: soconnell@andrews-engineering.com

1. Deed of Property recorded with Norfolk Registry of Deeds in Book_____, Page_____, (or Certificate of Title No._____) See Attachment A

2. Location and Description of Property:
   48.584± acres of undeveloped land located off Spring Street

   Zoning District: Rural Residential I
   Assessor's Map: _____ Lot: See Attachment A
   Square Footage of Building(s): N/A
   Impervious Coverage of Existing Upland: 0 s.f.

3. Purpose of Site Plan:
   Construction of a large scall ground mounted solar energy system and associated utility & access.

4. Special Permit(s) Requested:
   Chapter 185, Attachment 4 Use Regulations Schedule 3.14c

5. Special Permit Criteria: please provide on a separate document, written findings for special permit criteria a-g for each special permit being requested. Criteria are listed below. Applications will not be accepted until findings are submitted.

Chapter 185, Section 45.E

(3). Findings. Special permits shall be granted by the special permit granting authority only upon its written determination that the proposed use will not have adverse effects which overbalance its beneficial effects on either the neighborhood or the Town, in view of the particular characteristics of the site and of the proposal in relation to that site. This determination shall be in addition to the following specific findings:

(a) Proposed project addresses or is consistent with neighborhood or Town need.

(b) Vehicular traffic flow, access and parking and pedestrian safety are properly addressed.

(c) Public roadways, drainage, utilities and other infrastructure are adequate or will be upgraded to accommodate development.

(d) Neighborhood character and social structure will not be negatively impacted.

(e) Project will not destroy or cause substantial damage to any environmentally significant natural resource, habitat, or feature or, if it will, proposed mitigation, remediation, replication, or compensatory measures are adequate.

(f) Number, height, bulk, location and siting of building(s) and structure(s) will not result in abutting properties being deprived of light or fresh air circulation or being exposed to flooding or subjected to excessive noise, odor, light, vibrations, or airborne particulates.

(g) Water consumption and sewer use, taking into consideration current and projected future local water supply and demand and wastewater treatment capacity, will not be excessive.

6. Other issues requiring Planning Board Consideration: _____

_____

_____

7. A certified list (by Office of the Assessors) of abutters within 300 feet of the site is also submitted with the application.

8. Certificate of Ownership.

Alan L. Clapp
Signature of Applicant

ALAN L. CLAPP
Print Name of Applicant

See Attachment A
Signature of Owner

See Attachment A
Print Name of Owner

ATTACHMENT A

OWNERS OF RECORD

Parcel ID: 323-044-000-000:

Anthony Depoto et als

8 Spring St

Franklin, MA 02038

Norfolk Registry of Deeds

Book 6132, Page 396

Owner signature: _____ date: _____

Parcel ID: 310-002-000-000:

Richard F Costello

PO Box 283

Franklin, MA 02038

Norfolk Registry of Deeds

Book 2731, Page 108

Owner signature: _____ date: 10/16/18

Parcel ID: 309-015-000-000:

Michael J Bucci

4 Almond Drive

Johnston, RI 02919-3052

Norfolk Registry of Deeds

Book 34238, Page 115

Owner signature: _____ date: 10/17/18

Certificates of Ownership

CERTIFICATE OF OWNERSHIP

I the undersigned Applicant, do hereby certify to the Town of Franklin, through its Planning Board, that all parties of interest to the below-listed plan are identified in Section B: below,

SECTION A:

Type of Plan (circle one) ANR 81-P; Preliminary Subdivision

Definitive Subdivision.; Site Plan; Special Permit

Title of Plan: Large Capacity Ground Mounted Solar Energy System

Date of Plan: 11/21/2018 Assessor's Information: 309-015-000-000

Prepared by: Andrews Survey & Engineering, Inc.

Applicant Name & Address: Spring Street Renewables, LLC
101 Summer St, 2nd Floor, Boston, MA 02110

SECTION B:

Name of Record Owner(s): Michael J Bucci

Address of Record Owner(s): 4 Almond Drive

Johnston, RI 02919-3052

****Attach Property Deed matching the owner name's listed above.**

*If in the name of a Trust, Corporation or Partnership, list the names and addresses of all Trustee(s), Corporate Officer(s) or Partner(s):

*If in the name of a Trust or Corporation, list the Beneficiary(ies) of the Trust or the Shareholder(s) of the Corporation:

*If in the name of a Trust or Corporation, list the date, county, book and page of recording of the Trust Instrument, or the date and State of incorporation:

Executed as a sealed instrument this _____ day of _____ 20 _____

Alan L. Clapp
Signature of Applicant

ALAN L. CLAPP
Print name of Applicant

Signature of Owner

Michael J. Bucci
Print name of Owner

COMMONWEALTH OF MASSACHUSETTS

_____ ss. 20 18

On this 22 day of October 20 18, before me, the undersigned notary public, personally appeared Michael Bucci *(name of owner)*, proved to me through satisfactory evidence of identification, which were RI licence to be the person whose name is signed on the preceding document in my presence.

(Official signature and seal of notary)
Notary Public:
My Commission Expires: 11-2-2023

CERTIFICATE OF OWNERSHIP

I the undersigned Applicant, do hereby certify to the Town of Franklin, through its Planning Board, that all parties of interest to the below-listed plan are identified in Section B: below,

SECTION A:

Type of Plan (circle one) ANR 81-P; Preliminary Subdivision

Definitive Subdivision.; Site Plan; Special Permit

Title of Plan: Large Capacity Ground Mounted Solar Energy System

Date of Plan: 11/21/2018 Assessor's Information: 310-002-000-000

Prepared by: Andrews Survey & Engineering, Inc.

Applicant Name & Address: Spring Street Renewables, LLC
101 Summer St, 2nd Floor, Boston, MA 02110

SECTION B:

Name of Record Owner(s): Richard F Costello

Address of Record Owner(s): PO Box 283

Franklin, MA 02038

****Attach Property Deed matching the owner name's listed above.**

*If in the name of a Trust, Corporation or Partnership, list the names and addresses of all Trustee(s), Corporate Officer(s) or Partner(s):

*If in the name of a Trust or Corporation, list the Beneficiary(ies) of the Trust or the Shareholder(s) of the Corporation:

*If in the name of a Trust or Corporation, list the date, county, book and page of recording of the Trust Instrument, or the date and State of incorporation:

Executed as a sealed instrument this day of 20

Alan L. Clapp
Signature of Applicant

ALAN L. CLAPP
Print name of Applicant

Paul K Costello
Signature of Owner

PAUL K COSTELLO
Print name of Owner

COMMONWEALTH OF MASSACHUSETTS

_____ ss. 2018

On this 22nd day of October 2018, before me, the undersigned notary public, personally appeared Paul Costello *(name of owner)*, proved to me through satisfactory evidence of identification, which were MA License to be the person whose name is signed on the preceding document in my presence.

Donna S Rovedo
(Official signature and seal of notary)
Notary Public:
My Commission Expires: 11-2-2023

CERTIFICATE OF OWNERSHIP

I the undersigned Applicant, do hereby certify to the Town of Franklin, through its Planning Board, that all parties of interest to the below-listed plan are identified in Section B: below,

SECTION A:

Type of Plan (circle one) ANR 81-P; Preliminary Subdivision

Definitive Subdivision.; Site Plan; Special Permit

Title of Plan: Large Capacity Ground Mounted Solar Energy System

Date of Plan: 11/21/2018 Assessor's Information: 323-044-000-000

Prepared by: Andrews Survey & Engineering, Inc.

Applicant Name & Address: Spring Street Renewables, LLC
101 Summer St, 2nd Floor, Boston, MA 02110

SECTION B:

Name of Record Owner(s): Anthony Depoto, etals

Address of Record Owner(s): 8 Spring St

Franklin, MA 02038

****Attach Property Deed matching the owner name's listed above.**

*If in the name of a Trust, Corporation or Partnership, list the names and addresses of all Trustee(s), Corporate Officer(s) or Partner(s):

*If in the name of a Trust or Corporation, list the Beneficiary(ies) of the Trust or the Shareholder(s) of the Corporation:

*If in the name of a Trust or Corporation, list the date, county, book and page of recording of the Trust Instrument, or the date and State of incorporation:

Executed as a sealed instrument this 19th day of Oct 2018

Alan L. Clapp
Signature of Applicant

ALAN L. CLAPP
Print name of Applicant

Richard Depoto
Signature of Owner

Richard Depoto
Print name of Owner

COMMONWEALTH OF MASSACHUSETTS

_____ss. 20____

On this 19th day of October 2018, before me, the undersigned notary public, personally appeared Richard Depoto *(name of owner)*, proved to me through satisfactory evidence of identification, which were license to be the person whose name is signed on the preceding document in my presence.

Robin J. LaRosa
(Official signature and seal of notary)
Notary Public:
My Commission Expires: 9/24/21

Robin J. LaRosa
Notary Public
COMMONWEALTH OF MASSACHUSETTS
My Commission Expires
September 24, 2021

Certified Abutters List

Town of Franklin – Board of Assessors
355 East Central St
Franklin, MA 02038
Tel # 508-520-4920
Fax # 508-520-4923

RECEIVED
TOWN OF FRANKLIN
OCT 10 2018
BOARD OF ASSESSORS

Abutters List Request Form

Please Note: **A $25.00 fee per list is required to process your request. Payment is due at the time of submission of this form. Please allow 10 days from the date of both payment and submission of the form for the Assessors office to complete processing your request. (Revised 1-1-17)**

Date of Request 10 / 9 / 2018

Assessors Parcel ID # (12 digits) 323 309 310 - 044 015 002 - 000 000 000 - 000 000 000

Property Street Address Spring Street

Distance Required From Parcel # listed above (**Circle One**) **500** **(300)** **100**
(Note: if a distance is not circled, we cannot process your request)

Property Owner Anthony Depoto, Michael J Bucci, Richard F Costello

Property Owner's Mailing Address Spring St

Town/City Franklin State MA Zip Code 02038

Property Owner's Telephone # _____ - _____ - _____

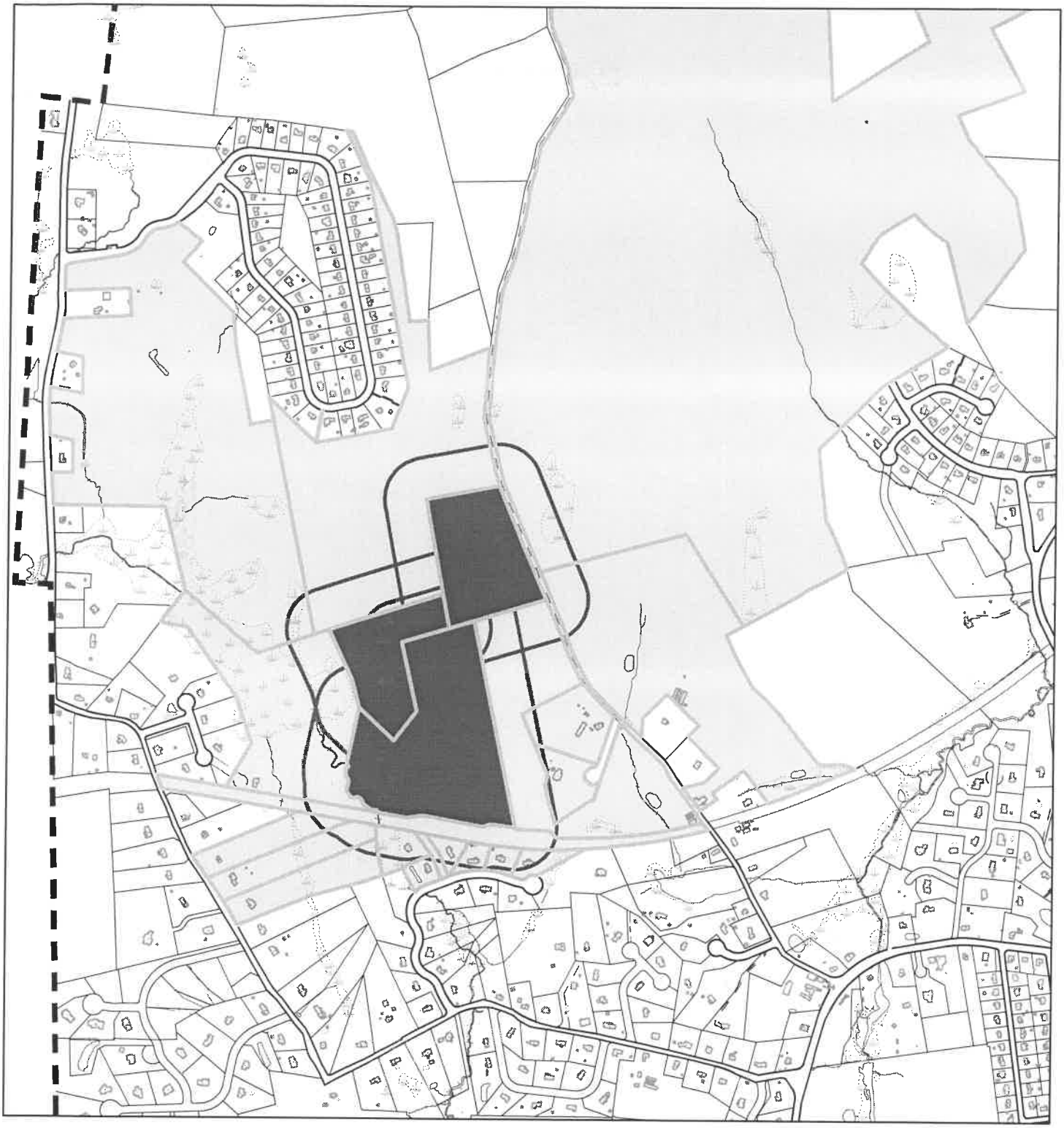
Requestor's Name (if different from Owner) Linda Bradley, Andrews Survey & Engineering

Requestor's Address 104 Mendon St, Uxbridge, MA 01569

Requestor's Telephone # 508 - 278 - 3897

Office Use Only: Date Fee Paid ___/___/_____ Paid in Cash $ ___.___

Paid by Check $ ___.___ Check # _____ Town Receipt # _____



SPRING ST [309-015, 310-002 & 323-044] - 300' ABUTTERS

TOWN OF FRANKLIN

0 1,000 2,000 Feet

N W E S

10/10/2018

300' Abutters List Report

Franklin, MA
October 10, 2018

Subject Parcel:

Parcel Number: 309-015-000
CAMA Number: 309-015-000-000
Property Address: PEPPERMILL LN

Mailing Address: BUCCI MICHAEL J
4 ALMOND DRIVE
JOHNSTON, RI 02919-3052

Subject Parcel:

Parcel Number: 310-002-000
CAMA Number: 310-002-000-000
Property Address: SPRING ST

Mailing Address: COSTELLO RICHARD F
P O BOX 283
FRANKLIN, MA 02038

Subject Parcel:

Parcel Number: 323-044-000
CAMA Number: 323-044-000-000
Property Address: SPRING ST

Mailing Address: DEPOTO ANTHONY ETALS
8 SPRING ST
FRANKLIN, MA 02038

Abutters:

Parcel Number: 293-001-000
CAMA Number: 293-001-000-000
Property Address: FORGE HILL RD

Mailing Address: COMMONWEALTH OF MASSACHUSETTS
DIVISION OF STATE PARKS AND RE
251 CAUSEWAY ST, STE 600
BOSTON, MA 02114

Parcel Number: 308-024-000
CAMA Number: 308-024-000-000
Property Address: OXFORD DR

Mailing Address: FRANKLIN TOWN OF
355 EAST CENTRAL STREET
FRANKLIN, MA 02038

Parcel Number: 308-076-000
CAMA Number: 308-076-000-000
Property Address: PROSPECT ST

Mailing Address: HENO FLOYD
398 PROSPECT ST
FRANKLIN, MA 02038

Parcel Number: 309-015-000
CAMA Number: 309-015-000-000
Property Address: PEPPERMILL LN

Mailing Address: BUCCI MICHAEL J
4 ALMOND DRIVE
JOHNSTON, RI 02919-3052

Parcel Number: 310-001-000
CAMA Number: 310-001-000-000
Property Address: 30 SPRING ST

Mailing Address: COCHRAN HARRY G & BARBARA E TR 30
SPRING STREET REALTY TRUST
30 SPRING ST
FRANKLIN, MA 02038

Parcel Number: 310-002-000
CAMA Number: 310-002-000-000
Property Address: SPRING ST

Mailing Address: COSTELLO RICHARD F
P O BOX 283
FRANKLIN, MA 02038

Parcel Number: 323-002-000
CAMA Number: 323-002-000-000
Property Address: 2 DEPOTO DR

Mailing Address: MAZUKINA EDWARD MAZUKINA KAREN
M
2 DEPOTO DR
FRANKLIN, MA 02038

300' Abutters List Report

Franklin, MA
October 10, 2018

Parcel Number:	323-003-000	Mailing Address:	KERR RONALD E
CAMA Number:	323-003-000-000		19 KENNEY RD
Property Address:	DEPOTO DR		MEDFIELD, MA 02052
Parcel Number:	323-004-000	Mailing Address:	LESSARD WILLIAM F LESSARD LISA A
CAMA Number:	323-004-000-000		3 DEPOTO DR
Property Address:	3 DEPOTO DR		FRANKLIN, MA 02038
Parcel Number:	323-005-000	Mailing Address:	KUYKENDALL GREGORY S & JILL
CAMA Number:	323-005-000-000		KUYKENDALL GARY & MARGARET GAY
Property Address:	14 BUBBLING BROOK DR		14 BUBBLING BROOK DR
			FRANKLIN, MA 02038
Parcel Number:	323-006-000	Mailing Address:	VONNEGUT KARL F & HEDWIG L
CAMA Number:	323-006-000-000		HEDMAN JUDITH V
Property Address:	16 BUBBLING BROOK DR		16 BUBBLING BROOK DR
			FRANKLIN, MA 02038
Parcel Number:	323-007-000	Mailing Address:	BECKMANN ROBERT M BECKMANN
CAMA Number:	323-007-000-000		MELISSA B
Property Address:	18 BUBBLING BROOK DR		18 BUBBLING BROOK DR
			FRANKLIN, MA 02038
Parcel Number:	323-040-000	Mailing Address:	COMMONWEALTH OF MASSACHUSETTS
CAMA Number:	323-040-000-000		DIVISION OF STATE PARKS AND RE
Property Address:	PROSPECT ST		251 CAUSEWAY STREET - SUITE 60
			BOSTON, MA 02114-2104
Parcel Number:	323-041-000	Mailing Address:	MORSE PATRICIA L TR L/E
CAMA Number:	323-041-000-000		WADSWORTH FARM REALTY TRUST MO
Property Address:	SPRING ST		17 SPRING ST
			FRANKLIN, MA 02038
Parcel Number:	323-043-000	Mailing Address:	POLITO ERIC J POLITO KRISTEN M
CAMA Number:	323-043-000-000		2 COCHRAN WAY
Property Address:	2 COCHRAN WAY		FRANKLIN, MA 02038
Parcel Number:	323-044-000	Mailing Address:	DEPOTO ANTHONY ETALS
CAMA Number:	323-044-000-000		8 SPRING ST
Property Address:	SPRING ST		FRANKLIN, MA 02038
Parcel Number:	323-046-000	Mailing Address:	MORSE PATRICIA L
CAMA Number:	323-046-000-000		17 SPRING ST
Property Address:	SPRING ST		FRANKLIN, MA 02038
Parcel Number:	324-017-000	Mailing Address:	DAVIS ALAN R JR DAVIS LISA P
CAMA Number:	324-017-000-000		15 PEPPERMILL LN
Property Address:	15 PEPPERMILL LN		FRANKLIN, MA 02038
Parcel Number:	324-023-000	Mailing Address:	MAHER PHILIP L MAHER DONNA
CAMA Number:	324-023-000-000		46 CRESTVIEW TER
Property Address:	250 PROSPECT ST		STRATHAM, NH 03885

300' Abutters List Report

Franklin, MA
October 10, 2018

Parcel Number:	324-024-000	Mailing Address:	DONOVAN JAMES C DONOVAN ANN-MARIE 244 PROSPECT ST FRANKLIN, MA 02038
CAMA Number:	324-024-000-000		
Property Address:	244 PROSPECT ST		
Parcel Number:	324-025-000	Mailing Address:	GILLIS SUSAN L GILLIS PATRICK J 240 PROSPECT ST FRANKLIN, MA 02038
CAMA Number:	324-025-000-000		
Property Address:	240 PROSPECT ST		
Parcel Number:	324-031-000	Mailing Address:	KLEIN STUART J 4 DEPOTO DR FRANKLIN, MA 02038
CAMA Number:	324-031-000-000		
Property Address:	4 DEPOTO DR		

Kevin M. Doyle, 10-10-18

Property Deeds

2731

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The land hereby granted was included in an affidavit made by Henry F. Long, Commissioner of Corporations and Taxation, recorded on August 8, 1947, in the Norfolk Registry of Deeds, Book 2698, Page 501, Document No. ______, Certificate of Title No. ______, relative to the value of certain parcels of land taken by said town for non-payment of taxes and to the validity of the tax titles held thereon; and was offered for sale at public auction on December 5, 1947, in accordance with a notice of sale posted on November 19th, 1947, in Selectmen's Office, Franklin, Mass. (SPECIFY PLACE WHERE NOTICE WAS POSTED); and was sold to the above-named grantee at the original time and place appointed for the sale, December 5, 1947, he being the highest bidder whose bid was not rejected as inadequate.

This deed is given with the covenant that the aforesaid sale was in all particulars conducted according to law.

Executed as a sealed instrument this 15th day of December, 1947

William R. Feeley, Treasurer of the Town of Franklin

THE COMMONWEALTH OF MASSACHUSETTS

Norfolk, ss. December 15, 1947

Then personally appeared the above-named William R. Feeley and acknowledged the foregoing instrument to be his free act and deed as Treasurer as aforesaid, before me,

My commission expires January 30, 1953

Evelyn Agnes Bassett
Notary Public

THIS FORM APPROVED BY HENRY F. LONG, COMMISSIONER OF CORPORATIONS AND TAXATION.

Rec'd & entered for record Dec. 30, 1947 at 12h. 56m. P.M.

THIS DEED NOT VALID UNLESS RECORDED IN THE PROPER REGISTRY OF DEEDS WITHIN 60 DAYS AFTER THE SALE

FORM 474

TREASURER'S DEED TO A PERSON
LAND OF LOW VALUE

THE COMMONWEALTH OF MASSACHUSETTS

FRANKLIN
NAME OF CITY OR TOWN

OFFICE OF THE TREASURER

I, William R. Feeley, Treasurer of the Town of Franklin, pursuant to the provisions of General Laws, Chapter 60, Section 79, in consideration of -----Forty (40) ---------------- no/100 dollars to me paid, hereby grant to Richard F. Costello of Franklin, Massachusetts, the parcels of land described in the instrument of taking or tax collector's deed to which reference is made in the following schedule:

NAME OF PERSON ASSESSED IN THE YEAR OF THE TAX FOR WHICH THE LAND WAS TAKEN OR SOLD / LOCATION OF PARCEL	INSTRUMENT OF TAKING OR TAX TITLE DEED — RECORDED: Book	Page	REGISTERED: Document No.	Certificate of Title No.	NAMES OF INTERESTED PERSONS SERVED BY REGISTERED MAIL WITH NOTICE OF SALE UNDER CHAPTER 60, SECTION 79 A
Nellie A. Batchelor, et al, Land off Spring Street.	2178	101			Mae Austin
John Jarvis Woodland off Mill Street	2178	107			John Jarvis, Heirs and Devisees, Catherine Jarvis.
Edna A. Bright Bald Hill Lot	2205	429			Edna A. Bright, Robert Wyllie
Hollis Minot, et al Lots 62 & 63, Martin Park Hill St.	2205	438			Hollis Minot, Florence Minot, Grace Minot.

(ATTACH SCHEDULE IF MORE SPACE IS NEEDED. STATE NUMBER OF SCHEDULES ATTACHED ______)

RECEIVED AND RECORDED
NORFOLK COUNTY
REGISTRY OF DEEDS
DEDHAM, MA

CERTIFY
William P O'Donnell
WILLIAM P. O'DONNELL, REGISTER

Bk 34238 Pg115 #64040
07-05-2016 @ 09:52a

QUITCLAIM DEED

I, MICHAEL L. BUCCI, of 4 Almond Drive, Johnston, Rhode Island, in consideration paid in the sum of One Dollar ($1.00), grant to MICHAEL J. BUCCI, of 4 Almond Drive, Johnston, Rhode Island, as sole owner, with QUITCLAIM COVENANTS:

See Exhibit "A" attached

This conveyance is such that no documentary stamps are required.

For Title, see Quitclaim Deed recorded in Book 29571, Page 490.

The purpose of this deed is to correctly state the owner's middle initial. In the deed of transfer, which is recorded in Book 29571, Page 490, the owner's middle initial is incorrectly stated as "L".

WITNESS my hand this 29 day of June, 2016.

MICHAEL L. BUCCI

STATE OF RHODE ISLAND
COUNTY OF PROVIDENCE

In Johnston, on the 29th day of June, 2016, before me personally appeared, **MICHAEL L. BUCCI**, before me known and known by me to be the party executing the foregoing instrument, and he acknowledged said instrument, by him executed, to be his free act and deed.

Frank Joseph Manni
Notary Public,
My Commission Expires:

Property Street Address: Peppermill Lane, Franklin, MA

EXHIBIT "A"

The land in Franklin, Norfolk County, Massachusetts, described as follows:

The remaining parcel of land, standing in the name of Donald S. McStay and Beverly A. McStay, Trustees of TE Realty Trust, of the property which was formerly the homestead farm of Otis Wales, now deceased, which contained eighty-six (86) acres, more or less, and was situated in the southwest part of Franklin, on both sides of Prospect Street, and bounded as follows:

NORTHERLY: by lands now or formerly of James P. and Edgar K. Ray;

EASTERLY: by land now or formerly of John Canney;

SOUTHERLY: by said Canney land and by lands now or formerly of Joseph P. Wadsworth and Adin D. Sargeant; and

WESTERLY: by other land now or formerly of said Sargeant and by land now or formerly of Joel A. and George A. Crooks.

Saving and excepting to the New York and New England Railroad Company all rights of said Company therein.

Subject to grant to American Telephone and Telegraph Company, recorded with Norfolk Registry of Deeds in Book 4519, Page 527.

There is excepted herefrom Lots I, 2, 3, 4 and 5 shown on a Plan of Land entitled "Modification Plan of Peppermill Farms, Franklin, Mass., August 29, 1988, Guerriere & Hanlon, Inc.," filed with Norfolk Deeds as Plan No. 1225 of 1988 in Plan Book 374. Lots 1 and 2, having been subdivided

into Lots IA and 2A and shown on a plan of land prepared for Donabee Realty Inc. and entitled "Plan of Land in Franklin, Mass. Date June 20, 1989 Scale 40 ft. to an inch" recorded with the Norfolk County Registry of Deeds as Plan No. 873 of 1989 in Plan Book 385, were conveyed along with Lots 4 and 5, by deed dated December 8, 1992 and recorded with said Registry of Deeds in Book 9656, Page 472. Lot 3 was previously conveyed by deed dated October 12, 1990 and recorded with said Registry of Deeds in Book 8764, Page 586.

Also excepting herefrom that certain parcel of land shown as Lot 6 on a plan of land entitled "Peppermill Farms II Definitive Subdivision Plan of Land in Franklin, Mass Scale: 1" = 100' March 14,1997, Rev. June 16, 1997, Rev. June 30, 1997, Rev. July 1, 1997, Salvetti, Surveying & Engineering Assoc." which said Lot was previously conveyed by deed dated September 29, 1999 and recorded with the Norfolk County Registry of deeds in Book 13765, Page 433.

Meaning and intending to convey, and hereby conveying, the land shown as Lot 15 on the Town of Franklin's Assessor's Map 309, containing approximately 9.734 acres of land.

Being a portion of the premises conveyed to these Grantors by deed dated April 13, 1992 and recorded with the Norfolk County Registry of Deeds in Book 9296, Page 292.

6132

396

MASSACHUSETTS QUITCLAIM DEED INDIVIDUAL (LONG FORM) 902

I, Dominic A. DePoto, surviving trustee of Dominic A. DePoto Family Trust under a Declaration of Trust dated February 14, 1970, registered of in Norfolk Registry District of the Land Court as Document No. 306774

for consideration paid, and in full consideration of One Thousand Dollars

grants to Anthony R. DePoto, Stone St., Bellingham, Mass., Edward J. DePoto, 4 Doten Rd., Plymouth, Mass., Donna A. Brunelli, 8 Spring St., Franklin, Mass. and Richard J. DePoto, 825 Washington St., Franklin, Mass., all as Tenants in Common with quitclaim covenants

Property address: Spring St., Franklin, MA

PARCEL A:

The land in Franklin off Washington Street and shown on a plan entitled "Plan of Farm in So. Franklin near Wadsworth, Michael T. Twomey, Scale 100' = 1", dated September 1908 by William E. Mann, Surveyor and filed with Norfolk Registry of Deeds as Plan No. 2557B, Plan Book 54, and shown on this plan as an unnumbered lot but designated as Lot 25 3/4 acres to 2nd dotted line, bounded and described as follows:

EASTERLY:	by land of owners unknown, fifteen hundred fifty (1550) feet more or less;
SOUTHERLY:	by land of N.Y., N.H. & Hartford Railroad by a fence, nine hundred seventy (970) feet more or less to the brook and a culvert; thence running
SOUTHERLY AND WESTERLY:	in a curved line, by the bed of said brook; thence bounded
NORTHWESTERLY:	by the dotted line, three hundred ninety (390) feet to end of wall as marked on said plan by land shown as Ray's Lot; thence bounded
NORTHEASTERLY:	by said Ray's Lot, three hundred fifty (350) feet; thence bounded
NORTHWESTERLY:	by said Ray's Lot, two hundred eighty (280) feet more or less, thence bounded
WESTERLY:	by said Ray's Lot, five hundred eleven (511) feet more or less; thence bounded
NORTHERLY:	by land of owners unknown, five hundred forty-three (543) feet to point of beginning at marked designation as stake and stones on said plan.

For my title see Norfolk Registry of Deeds, Book 4657, Page 169.

PARCEL B:

The land in Franklin, more particularly described as a certain piece or parcel of land situated on the northeasterly side of Grove Street in said Franklin and shown on a "Plan of Land in Franklin, Mass., June 1, 1960, McIntyre and Johnson, Inc., Registered Civil Engineers and Registered Land Surveyor", which plan is recorded with Norfolk Registry of Deeds as Plan No. 706 of 1960 in Plan Book 209, bounded and described according to said plan as follows:

Beginning at the northwesterly corner of the granted premises on the northeasterly side of Grove Street; thence running

NORTH 69 degrees, 34' 10" East by land now or formerly of Mathew A. and Loraine R. Spencer one hundred ninety-seven and 78/100 (197.78) feet to a stake; thence continuing

NORTH 69 degrees, 31' 00" East by land of said Spencer six hundred twenty-one and 94/100 (621.94) feet to an iron pipe at other land of Dominic A. DePoto; thence

SOUTH 29 degrees, 29' 49" East by land of said DePoto one hundred seventy-one and 38/100 (171.38) feet to a drill hole at a corner of a stone wall; thence

SOUTH 12 degrees, 12' 08" East by land now or formerly of George Greene one hundred seventeen and 38/100 (117.38) feet to a drill hole on a wall; thence

SOUTH 72 degrees, 38' 20" West by land of said Arthur J. Newell four hundred fifty and 31/100 (450.31) feet to a bend in the wall; thence

MAR 16 | 04 PM '89

CANCELLED EXCISE 02.28

SOUTH 65 degrees, 37' 50" West by land of said Newell one hundred ten and 90/100 (110.90) feet to a corner of a wall; thence
SOUTH 76 degrees, 24' 55" West five hundred thirty-seven and 537.54) feet to an iron pipe at said Grove Street; thence
NORTH 31 degrees, 50' 10" East by said Grove Street three hundred thirty-three and 90/100 (333.90) feet to a stake and point of beginning.

Containing 5.8 acres more or less or however the same may be bounded and described according to said plan.

For my title see Norfolk Registry of Deeds, Book 4657, Page 168.

Witness my hand and seal this 12th day of March 19 83

Dominic A. DePoto
Trustee

The Commonwealth of Massachusetts

Norfolk ss. March 12, 19 83

Then personally appeared the above named Dominic A. DePoto, surviving trustee of Dominic A. DePoto Family Trust

and acknowledged the foregoing instrument to be his free act and deed, before me

Anthony M. Vignone Notary Public

My Commission Expires January 18 19 85

Evidence of Site Control

Anthony Marinella, Manager
Lewis Street Realty, LLC
PO Box 411
Franklin, MA 02038

November 7, 2018

Franklin Planning Board
355 East Central Street
Franklin, MA 02038

Dear Chairperson and Members of the Franklin Planning Board:

Per the Franklin Zoning Bylaws and as part of the solar project permitting application, I hereby state the following with respect to documentation of access and control of the project site:

- The project site is comprised of three (3) parcels and a total of 48.6 acres, inclusive of the Depoto parcel shown as AP 323 lot 44, the Costello parcel shown as AP 310 lot 2 and the Bucci parcel shown as AP 309 lot 15.

- I, as Manager for Lewis Street Realty, LLC, did enter into an amended and restated lease option agreement, including access easements, with Spring Street Renewables, LLC, dated October 26, 2018 for a duration of eighteen (18) months. This lease option agreement remains in full force and effect.

- In addition, as Manager for Lewis Street Realty, LLC, I also have entered in to three separate purchase and sale agreements with the respective property owners for the project site, which include the representatives of the estate of Anthony R. and Edward J. Depoto (AP 323/44), the Trustees of the Costello Family Trust (AP 310/2) and Michael Bucci (AP 309/15).

- The full term of the subsequent ground lease agreement with Spring Street Renewables, LLC, including any possible extension(s), is forty (40) years.

- The lease agreement includes terms and conditions that ensure continuation in full force and effect in case of any change of property ownership.

Sincerely,

Anthony Marinella, Manager
Lewis Street Realty, LLC

COLLATERAL ASSIGNMENT
OF
REAL ESTATE PURCHASE AND SALE AGREEMENT

(the "Assignment")

October 24, 2018

FOR VALUE RECEIVED, **Lewis Street Realty LLC**, a Massachusetts limited liability company with an address of PO Box 411, Franklin MA 02038 ("**Lewis Street**"), hereby assigns to **Spring Street Renewables, LLC**, a Delaware limited liability company with a principal place of business at 4 Liberty Square, 3rd Floor, Boston, MA 02109, its successors and assigns ("**Nexamp**"), all of its right, title and interest in the "Real Estate Purchase and Sale Agreements" by and between Lewis Street and Donna A. Brunelli, Richard J. Depoto, Jean M. Bruneault, as Personal Representative of the Estate of Anthony R. Depoto and Lawrence Benedetto and Gerald Tulis, as Co-Executors/Personal Representatives of the Estate of Edward J. Depoto; between Lewis Street and Michael Bucci; and between Lewis Street and Dennis B. Costello and Paul K. Costello, Trustees of the Costello Family Trust u/d/t dated October 12, 1992 and recorded with the Norfolk County Registry of Deeds in Book 9570, Page 301 (the "**Sellers**"), dated as of August 31, 2018, and as each agreement may be amended from time to time (the "**P/S Agreements**"), related to the purchase and sale of approximately 48.6 acres of real property located in the Spring Street section of Franklin, Massachusetts, as more particularly described in Appendix A attached hereto (the "**Property**").

Spring Street and Lewis Street are parties to the "Amended and Restated Lease Option Agreement" dated October 26, 2018 (the "**Lease Option**"), under which Lewis Street grants to Spring Street an option to lease all or a portion of the Property (as defined in the Lease Option) upon Lewis Street's purchase of the Property pursuant to the P/S Agreement, and other documents and instruments executed and delivered by Lewis Street and others and related to the Lease Option (collectively, the "**Lease Documents**"). This Assignment is given as collateral to secure Lewis Street's obligations under the Lease Documents (collectively, the "**Obligations**").

Lewis Street agrees that Spring Street does not assume any of Lewis Street's obligations under the P/S Agreement until Spring Street gives to Seller written notice that it has affirmatively exercised its rights to acquire the Property under the P/S Agreement upon or after a Lewis Street Event of Default under any of the Lease Documents or under the P/S Agreement.

Lewis Street represents and warrants that the P/S Agreement is a valid, enforceable agreement; that neither party is in default under the P/S Agreement and that all conditions and agreements have been performed as required, except those not due to be performed until after the date of this Assignment; and that Lewis Street has obtained the Seller's agreement and consent regarding this Assignment in the form of the "Agreement Regarding Consent to Collateral Assignment of Real Estate Purchase and Sale Agreement" attached hereto as Appendix B. Lewis Street shall not consent to any change in the terms of the P/S Agreement without the written approval of Spring Street and no change in the terms of the P/S Agreement will be valid without

the written approval of Spring Street. Lewis Street agrees not to transfer or encumber in any way its interest in the P/S Agreement so long as this Assignment is in effect.

Lewis Street irrevocably appoints Spring Street as its attorney-in-fact to enforce, on and after the occurrence of an Event of Default under the Lease Documents, in its own name or in the name of Lewis Street, any or all of Lewis Street's rights arising under or in respect of the P/S Agreement in such manner as Spring Street reasonably shall deem necessary or appropriate to protect or preserve Spring Street's interests, including without limitation making payments under the P/S Agreement for and in the name of the Lewis Street or in the name of Spring Street, all with the same authority as Lewis Street could do if this Assignment had not been made.

This Assignment is for security purposes only. Accordingly, Spring Street has no right under this Assignment to enforce the provisions of the P/S Agreement until the occurrence of an Event of Default under any of the Lease Documents. If an Event of Default occurs, Spring Street may, without affecting any of its rights or remedies against Lewis Street under any of the Lease Documents, exercise its rights under this Assignment as Lewis Street's attorney-in-fact or in any other manner permitted by law and Spring Street will have all rights and remedies of a secured party under the law.

Lewis Street agrees to indemnify and hold Spring Street harmless against all claims, liabilities, losses and reasonable expenses (including reasonable attorneys' fees) which Spring Street may incur, in exercising any of its rights under this Assignment.

This Assignment is binding upon and for the benefit of the heirs, legal representatives, assigns, and successors in interest of Lewis Street and Spring Street.

This Collateral Assignment or a memorandum of it may be recorded among the land records of the jurisdiction where the Property is located.

(Signature is on the following page.)

IN WITNESS WHEREOF, Lewis Street has executed this Assignment as of the date first written above.

Witness:

Lewis Street Realty LLC

By: _____

Name: Anthony Marinella

Title: Manager

Commonwealth of Massachusetts)
County of Norfolk)

On this, the 24th day of October, 2018, before me, the undersigned officer, personally appeared Anthony Marinella, known to me ~~(or satisfactorily proven to me by~~ _____) to be the person whose name is subscribed to the within instrument, and acknowledged that he executed the same for the purposes therein contained.

In witness whereof I hereunto set my hand and official seal.

Brenda C. Steele
Notary Public

My Commission Expires: 05-27-2022

BRENDA C. STEELE
NOTARY PUBLIC
Commonwealth of Massachusetts
My Commission Expires May 27, 2022

APPENDIX A

Property Description

[insert P/S Agreements]

Appendix A - Property Description (Bucci)

STANDARD FORM PURCHASE & SALE AGREEMENT

1. PARTIES AND MAILING ADDRESSES *(fill in)*

As of the 31st day of August 2018

Michael Bucci of
4 Almond Drive, Johnston, RI 02919
hereinafter called the SELLER, agrees to SELL and
Lewis Street Realty LLC, a Massachusetts limited liability company with a principal place of business located at 28 Tia Place, P.O. Box ,411, Franklin, MA 02038

2. DESCRIPTION *(fill in and include title reference)*

hereinafter called the BUYER or PURCHASER, agrees to BUY, upon the terms hereinafter set forth, the following described premises: **A certain parcel of land known as 0 Peppermill Lane, Franklin, MA 02038, more fully described at the Norfolk County Registry of Deeds in Book 29519, Page 260. SEE ATTACHED ASSESSMENT AND SALES REPORT AND MAP.**

3. BUILDINGS, STRUCTURES, IMPROVEMENTS, FIXTURES

(fill in or delete)

Included in the sale as a part of said premises are the buildings, structures, and improvements now thereon, and the fixtures belonging to the SELLER and used in connection therewith including, if any, all wall-to-wall carpeting, drapery rods, automatic garage door openers, venetian blinds, window shades, screens, screen doors, storm windows and doors, awnings, shutters, furnaces, heaters, heating equipment, stoves, ranges, oil and gas burners and fixtures appurtenant thereto, hot water heaters, plumbing and bathroom fixtures, garbage disposers, electric and other lighting fixtures, mantels, outside television antennas, fences, gates, trees, shrubs, plants and, *ONLY IF BUILT IN*, refrigerators, air conditioning equipment, ventilators, dishwashers, washing machines and dryers,

but excluding:

4. TITLE DEED *(fill in)*

* *Include here by specific reference any restrictions, easements, rights and obligations in party walls not included in (b), leases, municipal and other liens, other encumbrances, and make provision to protect SELLER against BUYER's breach of SELLER's covenants in leases, where necessary.*

Said premises are to be conveyed by a good and sufficient quitclaim deed running to the BUYER, or to the nominee designated by the BUYER by written notice to the SELLER at least seven (7) days before the deed is to be delivered as herein provided, and said deed shall convey a good and clear record and marketable title thereto, free from encumbrances, except

a. Provisions of existing building and zoning laws;
b. Existing rights and obligations in party walls which are not the subject of written agreement;
c. Such taxes for the then current year as are not due and payable on the date of the delivery of such deed;
d. Any liens for municipal betterments **recorded after the deed to the BUYER;**
e. Easements, restrictions and reservations of record, if any, so long as the same do not prohibit or materially interfere with the current use of said premises;

*f.

5. PLANS

If said deed refers to a plan necessary to be recorded therewith the SELLER shall deliver such plan with the deed in form adequate for recording or registration.

6. REGISTERED TITLE

In addition to the foregoing, if the title to said premises is registered, said deed shall be in form sufficient to entitle the BUYER to a Certificate of Title of said premises, and the SELLER shall deliver with said deed all instruments, if any, necessary to enable the BUYER to obtain such Certificate of Title.

7. PURCHASE PRICE *(fill in) space is allowed to spell out the amounts if desired*

The agreed purchase price for said premises is [redacted]

[redacted] has been paid as a deposit this day and was paid with Offer

to be paid at the time of delivery of the deed in cash, or by certified, cashier's, check(s) or via wire.

[redacted]

8 TIME FOR PERFORMANCE DELIVERY OF DEED *(fill in)*

Such deed is to be delivered at 10:00 a.m. on the first to occur of: (a) February 28, 2019 or (b) on the day that is set by BUYER in a written notice to SELLER delivered at least ten (10) days prior to the closing date set therein that a solar company has agreed to enter into a ground lease with BUYER. Provided that application has been filed on or before December 1, 2018 with the Town of Franklin seeking approval of the planned solar project and the solar company is making good faith, best efforts to obtain approvals in a prompt manner, Seller will agree to extend the closing to on or before September 1, 2019 and will grant up to two extensions of twelve (12) months and six (6) months, respectively. Said Closing shall take place at time and date set above and ~~on the ____ day of _____, 2018~~ at the Norfolk County Registry of Deeds, unless otherwise agreed upon in writing. It is agreed that time is of the essence of this agreement.

9. POSSESSION AND CONDITION OF PREMISE *(attach a list of exceptions, if any)*

Full possession of said premises free of all tenants and occupants, except as herein provided, is to be delivered at the time of the delivery of the deed, said premises to be then (a) in the same condition as they now are, reasonable use and wear thereof excepted, and (b) not in violation of said building and zoning laws, and (c) in compliance with the provisions of any instrument referred to in clause 4 hereof. The BUYER shall be entitled personally to enter said premises prior to the delivery of the deed in order to determine whether the condition thereof complies with the terms of this clause.

10. EXTENSION TO PERFECT TITLE OR MAKE PREMISES CONFORM *(Change period of time if desired)*

If the SELLER shall be unable to give title or to make conveyance, or to deliver possession of the premises, all as herein stipulated, or if at the time of the delivery of the deed the premises do not conform with the provisions hereof, then ~~any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto, unless~~ the SELLER shall use reasonable efforts to remove any defects in title, or to deliver possession as provided herein, or to make the said premises conform to the provisions hereof, as the case may be, in which event the SELLER shall give written notice thereof to the BUYER at or before the time for performance hereunder, and thereupon the time for performance hereof shall be extended for a period of thirty (30) days.

11. FAILURE TO PERFECT TITLE OR MAKE PREMISES CONFORM, etc.

If at the expiration of the extended time the SELLER shall have failed so to remove any defects in title, deliver possession, or make the premises conform, as the case may be, all as herein agreed, or if at any time during the period of this agreement or any extension thereof, the holder of a mortgage on said premises shall refuse to permit the insurance proceeds, if any, to be used for such purposes, then any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto.

12. BUYER's ELECTION TO ACCEPT TITLE

The BUYER shall have the election, at either the original or any extended time for performance, to accept such title as the SELLER can deliver to the said premises in their then condition and to pay therefore the purchase price without deduction, in which case the SELLER shall convey such title, except that in the event of such conveyance in accord with the provisions of this clause, if the said premises shall have been damaged by fire or casualty insured against, then, at the BUYER's option, the SELLER shall, unless the SELLER has previously restored the premises to their former condition, either

a. pay over or assign to the BUYER, on delivery of the deed, all amounts recovered or recoverable on account of such insurance, less any amounts reasonably expended by the SELLER for any partial restoration, or
b. if a holder of a mortgage on said premises shall not permit the insurance proceeds or a part thereof to be used to restore the said premises to their former condition or to be so paid over or assigned, give to the BUYER a credit against the purchase price, on delivery of the deed, equal to said amounts so recovered or recoverable and retained by the holder of the said mortgage less any amounts reasonably expended by the SELLER for any partial restoration.

13. ACCEPTANCE OF DEED

The acceptance and recording of a deed by the BUYER or his nominee, as the case may be, shall be deemed to be a full performance and discharge of every agreement and obligation herein contained or expressed, except such as are, by the terms hereof, to be performed after the delivery of said deed.

14. USE OF MONEY TO CLEAR TITLE

To enable the SELLER to make conveyance as herein provided, the SELLER may, at the time of delivery of the deed, use the purchase money or any portion thereof to clear the title of any or all encumbrances or interests, provided that all instruments so procured are recorded simultaneously with the delivery of said deed.

15. INSURANCE **Insert amount (list additional types of insurance and amounts as agreed)*

Until the delivery of the deed, the SELLER shall maintain insurance on said premises as follows:

Type of Insurance	*Amount of Coverage*
a. Fire and Extended Coverage	*$ As Presently Insured
b.	

All risk to remain with SELLER until recording of the deed to BUYER.

Appendix A - Property Description (Bucci)

16. ADJUSTMENTS
(list operating expenses, if any, or attach schedule)

~~Collected rents, mortgage interest, water and sewer use charges, operating expenses (if any) according to the schedule attached hereto or set forth below, and~~ taxes for the then current fiscal year, shall be apportioned ~~and fuel value shall be adjusted~~, as of the day of performance of this agreement and the net amount thereof shall be added to or deducted from, as the case may be, the purchase price payable by the BUYER at the time of delivery of the deed. ~~Uncollected rents for the current rental period shall be apportioned if and when collected by either party~~.

17. ADJUSTMENT OF UNASSESSED AND ABATED TAXES

If the amount of said taxes is not known at the time of the delivery of the deed, they shall be apportioned on the basis of the taxes assessed for the preceding fiscal year, with a reapportionment as soon as the new tax rate and valuation can be ascertained; and, if the taxes which are to be apportioned shall thereafter be reduced by abatement, the amount of such abatement, less the reasonable cost of obtaining the same, shall be apportioned between the parties, provided that neither party shall be obligated to institute or prosecute proceedings for an abatement unless otherwise herein agreed.

18. BROKER'S FEE
(fill in fee with dollar amount or percentage; also name of Brokerage firm(s))

~~A Broker's fee for professional services of _____ is due from the SELLER to~~

~~the Broker(s) herein, but if the SELLER pursuant to the terms of clause 21 hereof retains the deposit made hereunder by the BUYER, said Broker(s) shall be entitled to receive from the SELLER an amount equal to one-half the amount so retained or an amount equal to the Broker's fee for professional services according to this contract, whichever is the lesser.~~

19. BROKER(S) WARRANTY
(fill in name)

~~The Broker(s) named herein warrant(s) that the Broker(s) is(are) duly licensed as such by the Commonwealth of Massachusetts.~~

20. DEPOSIT
(fill in name)

All deposits made hereunder shall be held in escrow by **Costello Realty** as escrow agent subject to the terms of this agreement and shall be duly accounted for at the time for performance of this agreement. In the event of any disagreement between the parties, the escrow agent shall retain all deposits made under this agreement pending instructions mutually given in writing by the SELLER and the BUYER or pursuant to a final order of a court of competent jurisdiction. [redacted].

21. BUYER's DEFAULT; DAMAGES

If the BUYER shall fail to fulfill the BUYER'S agreements herein, all deposits made hereunder by the BUYER shall be retained by the SELLER as liquidated damages ~~unless within thirty days after the time for performance of this agreement or any extension hereof, the SELLER otherwise notifies the BUYER in writing~~ **which shall be the Seller's sole remedy in law and in equity.**

22. RELEASE BY HUSBAND OR WIFE

The SELLER'S spouse hereby agrees to join in said deed and to release and convey all statutory and other rights and interests in said premises.

23. BROKER AS PARTY

The Broker(s) named herein join(s) in this agreement and become(s) a party hereto, insofar as any provisions of this agreement expressly apply to the Broker(s), and to any amendments or modifications of such provisions to which the Broker(s) agree(s) in writing.

24. LIABILITY OF TRUSTEE, SHAREHOLDER, BENEFICIARY, etc.

If the SELLER or BUYER executes this agreement in a representative or fiduciary capacity, only the principal or the estate represented shall be bound, and neither the SELLER or BUYER so executing, nor any shareholder or beneficiary of any trust, shall be personally liable for any obligation, express or implied, hereunder.

25. WARRANTIES AND REPRESENTATIONS
(fill in) if none state "none"; if any listed, indicate by whom each warranty or representation was made

The BUYER acknowledges that the BU[redacted] has not been influenced to enter into this transaction nor has he relied upon any warranties or representations not set forth or incorporated in this agreement or previously made in writing, except for the following additional warranties and representations, if any, made by either the SELLER or the Broker(s): **NONE, except as set forth in this agreement.**

Appendix A - Property Description (Bucci)

26. MORTGAGE CONTINGENCY CLAUSE *(omit if not provided for in Offer to Purchase)*

In order to help finance the acquisition of said premises, the BUYER shall apply for a conventional bank or other institutional mortgage loan of [redacted] at prevailing rates, terms and conditions. If, despite the BUYER'S diligent efforts, a commitment for such loan cannot be obtained on or before **thirty (30) days prior to closing** the BUYER may terminate this agreement by written notice to the SELLER and/or the Broker(s), as agent(s) for the SELLER, prior to the expiration of such time, whereupon any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto. ~~In no event will the BUYER be deemed to have used diligent efforts to obtain such commitment unless the BUYER submits a complete mortgage loan application conforming to the foregoing provisions on or before~~

27. CONSTRUCTION OF AGREEMENT

This instrument, executed in multiple counterparts, is to be construed as a Massachusetts contract, is to take effect as a sealed instrument, sets forth the entire contract between the parties, is binding upon and inures to the benefit of the parties hereto and their respective heirs, devisees, executors, administrators, successors and assigns, and may be cancelled, modified or amended only by a written instrument executed by both the SELLER and the BUYER. If two or more persons are named herein as BUYER their obligations hereunder shall be joint and several. The captions and marginal notes are used only as a matter of convenience and are not to be considered a part of this agreement or to be used in determining the intent of the parties to it.

28. LEAD PAINT LAW

The parties acknowledge that, under Massachusetts law, whenever a child or children under six years of age resides in any residential premises in which any paint, plaster or other accessible material contains dangerous levels of lead, the owner of said premises must remove or cover said paint, plaster or other material so as to make it inaccessible to children under six years of age.

29. SMOKE & CARBON MONOXIDE DETECTORS

The SELLER shall, at the time of the delivery of the deed, deliver a certificate from the fire department of the city or town in which said premises are located stating that said premises have been equipped with approved smoke and carbon monoxide detectors in conformity with applicable law.

30. ADDITIONAL PROVISIONS

The initialed riders, if any, attached hereto, are incorporated herein by reference.

~Subject to Clear Title;
~Subject to Buyer obtaining all permits/approvals;
~Subject to Buyer being able to operate a 6 Megawatt Solar Farm; and
~Subject to Buyer closing on all three parcels (0 Spring Street, 0 Spring St., 0 Peppermill Lane) See attached map.
See Rider A attached hereto and incorporated herein.
See Rider B, Collateral Assignment, attached hereto and incorporated herein.

FOR RESIDENTIAL PROPERTY CONSTRUCTED PRIOR TO 1978, BUYER MUST ALSO HAVE SIGNED LEAD PAINT "PROPERTY TRANSFER NOTIFICATION CERTIFICATION"

NOTICE: This is a legal document that creates binding obligations. If not understood, consult an attorney.

SELLER: _____
Print Name: Michael Bucci
Taxpayer ID/Social Security No.: _____

SELLER: _____
Print Name:
Taxpayer ID/Social Security No. _____

BUYER: LEWIS STREET REALTY LLC
By: _____
Print Name: Anthony Marinella, Manager
Taxpayer ID/Social Security No.: _____

BUYER: _____
Print Name:
Taxpayer ID/Social Security No. _____

BROKER(S)

Appendix A - Property Description (Costello)

STANDARD FORM PURCHASE & SALE AGREEMENT

1 PARTIES AND MAILING ADDRESSES *(fill in)*

As of the 31st day of August 2018

Dennis B. Costello and Paul K. Costello, Trustees of the Costello Family Trust u/d/t dated October 12, 1992 and recorded with the Norfolk County Registry of Deeds in Book 9570, Page 301, of 11601 Stablewatch Court, Cincinnati, Oh 45249 and 43 Gilmore Road, Wrentham, MA 02093, respectively hereinafter called the SELLER, agrees to SELL and
Lewis Street Realty LLC, a Massachusetts limited liability company with a principal place of business located at 28 Tia Place, P.O. Box ,411, Franklin, MA 02038

2. DESCRIPTION *(fill in and include title reference)*

hereinafter called the BUYER or PURCHASER, agrees to BUY, upon the terms hereinafter set forth, the following described premises: A certain parcel of land known as 0 Spring St., Franklin, MA 02038, more fully described at the Norfolk County Registry of Deeds in Book 9570, Page 307.
SEE ATTACHED ASSESSMENT AND SALES REPORT AND MAP.

3 BUILDINGS, STRUCTURES, IMPROVEMENTS, FIXTURES

(fill in or delete)

Included in the sale as a part of said premises are the buildings, structures, and improvements now thereon, and the fixtures belonging to the SELLER and used in connection therewith including, if any, all wall-to-wall carpeting, drapery rods, automatic garage door openers, venetian blinds, window shades, screens, screen doors, storm windows and doors, awnings, shutters, furnaces, heaters, heating equipment, stoves, ranges, oil and gas burners and fixtures appurtenant thereto, hot water heaters, plumbing and bathroom fixtures, garbage disposers, electric and other lighting fixtures, mantels, outside television antennas, fences, gates, trees, shrubs, plants and, ONLY IF BUILT IN, refrigerators, air conditioning equipment, ventilators, dishwashers, washing machines and dryers,

but excluding:

4. TITLE DEED *(fill in)*
* *Include here by specific reference any restrictions, easements, rights and obligations in party walls not included in (b), leases, municipal and other liens, other encumbrances, and make provision to protect SELLER against BUYER's breach of SELLER's covenants in leases, where necessary.*

Said premises are to be conveyed by a good and sufficient quitclaim deed running to the BUYER, or to the nominee designated by the BUYER by written notice to the SELLER at least seven (7) days before the deed is to be delivered as herein provided, and said deed shall convey a good and clear record and marketable title thereto, free from encumbrances, except

a. Provisions of existing building and zoning laws;
b. Existing rights and obligations in party walls which are not the subject of written agreement;
c. Such taxes for the then current year as are not due and payable on the date of the delivery of such deed;
d. Any liens for municipal betterments recorded after the deed to the BUYER;
e. Easements, restrictions and reservations of record, if any, so long as the same do not prohibit or materially interfere with the current use of said premises;
*f.

5. PLANS

If said deed refers to a plan necessary to be recorded therewith the SELLER shall deliver such plan with the deed in form adequate for recording or registration.

6. REGISTERED TITLE

In addition to the foregoing, if the title to said premises is registered, said deed shall be in form sufficient to entitle the BUYER to a Certificate of Title of said premises, and the SELLER shall deliver with said deed all instruments, if any, necessary to enable the BUYER to obtain such Certificate of Title.

7 PURCHASE PRICE *(fill in) space is allowed to spell out the amounts if desired*

The agreed purchase price for said premises is [redacted]
Dollars of which

[redacted]

[redacted] TOTAL

Appendix A - Property Description (Costello)

8. TIME FOR PERFORMANCE DELIVERY OF DEED *(fill in)*

Such deed is to be delivered at 10:00 a.m. on the first to occur of: (a) February 28, 2019 or (b) on the day that is set by BUYER in a written notice to SELLER delivered at least ten (10) days prior to the closing date set therein that a solar company has agreed to enter into a ground lease with BUYER. Provided that application has been filed on or before December 1, 2018 with the Town of Franklin seeking approval of the planned solar project and the solar company is making good faith, best efforts to obtain approvals in a prompt manner, Seller will agree to extend the closing to on or before September 1, 2019 and will grant up to two extensions of twelve (12) months and six (6) months, respectively Said Closing shall take place at time and date set above at the Norfolk County Registry of Deeds, unless otherwise agreed upon in writing. It is agreed that time is of the essence of this agreement.

9. POSSESSION AND CONDITION OF PREMISE *(attach a list of exceptions, if any)*

Full possession of said premises free of all tenants and occupants, except as herein provided, is to be delivered at the time of the delivery of the deed, said premises to be then (a) in the same condition as they now are, reasonable use and wear thereof excepted, and (b) not in violation of said building and zoning laws, and (c) in compliance with the provisions of any instrument referred [redacted] in clause 4 hereof. The BUYER shall be entitled personally to enter said premises prior to the delivery of the deed in order to determine whether the condition thereof complies with the terms of this clause.

10. EXTENSION TO PERFECT TITLE OR MAKE PREMISES CONFORM *(Change period of time if desired).*

If the SELLER shall be unable to give title or to make [redacted] to deliver possession of the premises, all as herein stipulated, or if at the time of the delivery of the deed the premises do not conform with the provisions hereof, then ~~any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto, unless~~ the SELLER shall use reasonable efforts to remove any defects in title, or to deliver possession as provided herein, or to make the said premises conform to the provisions hereof, as the case may be, in which event the SELLER shall give written notice thereof to the BUYER at or before the time for performance hereunder, and thereupon the time for performance hereof shall be extended for a period of thirty (30) days.

11. FAILURE TO PERFECT TITLE OR MAKE PREMISES CONFORM, etc

If at the expiration of the extended time the SELLER shall have failed so to remove any defects in title, deliver possession, or make the premises conform, as the case may be, all as herein agreed, or if at any time during the period of this agreement or any extension thereof, the holder of a mortgage on said premises shall refuse to permit the insurance proceeds, if any, to be used for such purposes, then any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto.

12. BUYER's ELECTION TO ACCEPT TITLE

The BUYER shall have the election, at either the original or any extended time for performance, to accept such title as the SELLER can deliver to the said premises in their then condition and to pay therefore the purchase price without deduction, in which case the SELLER shall convey such title, except that in the event of such conveyance in accord with the provisions of this clause, if the said premises shall have been damaged by fire or casualty insured against, then, at the BUYER's option, the SELLER shall, unless the SELLER has previously restored the premises to their former condition, either

a. pay over or assign to the BUYER, on delivery of the deed, all amounts recovered or recoverable on account of such insurance, less any amounts reasonably expended by the SELLER for any partial restoration, or
b. if a holder of a mortgage on said premises shall not permit the insurance proceeds or a part thereof to be used to restore the said premises to their former condition or to be so paid over or assigned, give to the BUYER a credit against the purchase price, on delivery of the deed, equal to said amounts so recovered or recoverable and retained by the holder of the said mortgage less any amounts reasonably expended by the SELLER for any partial restoration.

13. ACCEPTANCE OF DEED

The acceptance and recording of a deed by the BUYER or his nominee, as the case may be, shall be deemed to be a full performance and discharge of every agreement and obligation herein contained or expressed, except such as are, by the terms hereof, to be performed after the delivery of said deed.

14. USE OF MONEY TO CLEAR TITLE

To enable the SELLER to make conveyance as herein provided, the SELLER may, at the time of delivery of the deed, use the purchase money or any portion thereof to clear the title of any or all encumbrances or interests, provided that all instruments so procured are recorded simultaneously with the delivery of said deed.

15. INSURANCE **Insert amount (list additional types of insurance and amounts as agreed)*

Until the delivery of the deed, the SELLER shall maintain insurance on said premises as follows:

Type of Insurance	*Amount of Coverage*
a. Fire and Extended Coverage	*$ As Presently Insured
b.	*$

All risk to remain with SELLER until recording of deed to BUYER.

Appendix A - Property Description (Costello)

16. ADJUSTMENTS
(list operating expenses, if any, or attach schedule)

~~Collected rents, mortgage interest, water and sewer use charges, operating expenses (if any) according to the schedule attached hereto or set forth below, and~~ taxes for the then current fiscal year, shall be apportioned ~~and fuel value shall be adjusted,~~ as of the day of performance of this agreement and the net amount thereof shall be added to or deducted from, as the case may be, the purchase price payable by the BUYER at the time of delivery of the deed. ~~Uncollected rents for the current rental period shall be apportioned if and when collected by either party.~~

17. ADJUSTMENT OF UNASSESSED AND ABATED TAXES

If the amount of said taxes is not known at the time of the delivery of the deed, they shall be apportioned on the basis of the taxes assessed for the preceding fiscal year, with a reapportionment as soon as the new tax rate and valuation can be ascertained; and, if the taxes which are to be apportioned shall thereafter be reduced by abatement, the amount of such abatement, less the reasonable cost of obtaining the same, shall be apportioned between the parties, provided that neither party shall be obligated to institute or prosecute proceedings for an abatement unless otherwise herein agreed.

18. BROKER'S FEE
(fill in fee with dollar amount or percentage; also name of Brokerage firm(s))

~~A Broker's fee for professional services of ——— is due from the SELLER to the Broker(s) herein, but if the SELLER pursuant to the terms of clause 21 hereof retains the deposit made hereunder by the BUYER, said Broker(s) shall be entitled to receive from the SELLER an amount equal to one half the amount so retained or an amount equal to the Broker's fee for professional services according to this contract, whichever is the lesser.~~

19. BROKER(S) WARRANTY
(fill in name)

~~The Broker(s) named herein warrant(s) that the Broker(s) is(are) duly licensed as such by the Commonwealth of Massachusetts.~~

20. DEPOSIT
(fill in name)

[redacted]

21. BUYER's DEFAULT; DAMAGES

If the BUYER shall fail to fulfill the BUYER'S agreements herein, all deposits made hereunder by the BUYER shall be retained by the SELLER as liquidated damages ~~unless within thirty days after the time for performance of this agreement or any extension hereof, the SELLER otherwise notifies the BUYER in writing~~ which shall be the Seller's sole remedy in law and in equity.

22. RELEASE BY HUSBAND OR WIFE

The SELLER'S spouse hereby agrees to join in said deed and to release and convey all statutory and other rights and interests in said premises.

23. BROKER AS PARTY

The Broker(s) named herein join(s) in this agreement and become(s) a party hereto, insofar as any provisions of this agreement expressly apply to the Broker(s), and to any amendments or modifications of such provisions to which the Broker(s) agree(s) in writing.

24. LIABILITY OF TRUSTEE, SHAREHOLDER, BENEFICIARY, etc.

If the SELLER or BUYER executes this agreement in a representative or fiduciary capacity, only the principal or the estate represented shall be bound, and neither the SELLER or BUYER so executing, nor any shareholder or beneficiary of any trust, shall be personally liable for any obligation, express or implied, hereunder.

25. WARRANTIES AND REPRESENTATIONS
(fill in) if none state "none"; if any listed, indicate by whom each warranty or representation was made

The BUYER acknowledges that the BUYER has not been influenced to enter into this transaction nor has he relied upon any warranties or representations not set forth or incorporated in this agreement or previously made in writing, except for the following additional warranties and representations, if any, made by either the SELLER or the Broker(s): **NONE**, except as set forth in this agreement.

26 MORTGAGE CONTINGENCY CLAUSE
(omit if not provided for in Offer to Purchase)

In order to help finance the acquisition of said premises, the BUYER shall apply for a conventional bank or other institutional mortgage loan of [redacted] at prevailing rates, terms and conditions. If, despite the BUYER'S diligent efforts, a commitment for such loan cannot be obtained on or before thirty (30) days prior to closing the BUYER may terminate this agreement by written notice to the SELLER and/or the Broker(s), as agent(s) for the SELLER, prior to the expiration of such time, whereupon any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto. In no event will the BUYER be deemed to have used diligent efforts to obtain such commitment unless the BUYER submits a complete mortgage loan application conforming to the foregoing provisions on or before _____.

27. CONSTRUCTION OF AGREEMENT

This instrument, executed in multiple counterparts, is to be construed as a Massachusetts contract, is to take effect as a sealed instrument, sets forth the entire contract between the parties, is binding upon and inures to the benefit of the parties hereto and their respective heirs, devisees, executors, administrators, successors and assigns, and may be cancelled, modified or amended only by a written instrument executed by both the SELLER and the BUYER. If two or more persons are named herein as BUYER their obligations hereunder shall be joint and several. The captions and marginal notes are used only as a matter of convenience and are not to be considered a part of this agreement or to be used in determining the intent of the parties to it.

28. LEAD PAINT LAW

The parties acknowledge that, under Massachusetts law, whenever a child or children under six years of age resides in any residential premises in which any paint, plaster or other accessible material contains dangerous levels of lead, the owner of said premises must remove or cover said paint, plaster or other material so as to make it inaccessible to children under six years of age.

29. SMOKE & CARBON MONOXIDE DETECTORS

The SELLER shall, at the time of the delivery of the deed, deliver a certificate from the fire department of the city or town in which said premises are located stating that said premises have been equipped with approved smoke and carbon monoxide detectors in conformity with applicable law.

30. ADDITIONAL PROVISIONS

The initialed riders, if any, attached hereto, are incorporated herein by reference.

–Subject to Clear Title;
–Subject to Buyer obtaining all permits/approvals;
–Subject to Buyer being able to operate a 6 Megawatt Solar Farm; and
–Subject to Buyer closing on all three parcels (0 Spring Street, 0 Spring St., 0 Peppermill Lane) See attached map.
See Rider A attached hereto and incorporated herein.
See Rider B, Collateral Assignment, attached hereto and incorporated herein.

FOR RESIDENTIAL PROPERTY CONSTRUCTED PRIOR TO 1978, BUYER MUST ALSO HAVE SIGNED LEAD PAINT "PROPERTY TRANSFER NOTIFICATION CERTIFICATION"

NOTICE: This is a legal document that creates binding obligations. If not understood, consult an attorney.

SELLER: _____
Print Name: **Dennis B. Costello, Trustee**
Taxpayer ID/Social Security No.: _____

SELLER: _____
Print Name: **Paul K. Costello, Trustee**
Taxpayer ID/Social Security No._____

BUYER: By: _____
Print Name: **Anthony Marinella, Manager**
Taxpayer ID/Social Security No.: _____

BUYER: _____
Print Name:
Taxpayer ID/Social Security No. _____

BROKER(S)

Appendix A - Property Description (Costello)

26. MORTGAGE CONTINGENCY CLAUSE
(omit if not provided for in Offer to Purchase)

In order to help finance the acquisition of said premises, the BUYER shall apply for a conventional bank or other institutional mortgage loan of [redacted] at prevailing rates, terms and conditions. If, despite the BUYER'S diligent efforts, a commitment for such loan cannot be obtained on or before thirty (30) days prior to closing the BUYER may terminate this agreement by written notice to the SELLER and/or the Broker(s), as agent(s) for the SELLER, prior to the expiration of such time, whereupon any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto. In no event will the BUYER be deemed to have used diligent efforts to obtain such commitment unless the BUYER submits a complete mortgage loan application conforming to the foregoing provisions on or before _____.

27. CONSTRUCTION OF AGREEMENT

This instrument, executed in multiple counterparts, is to be construed as a Massachusetts contract, is to take effect as a sealed instrument, sets forth the entire contract between the parties, is binding upon and inures to the benefit of the parties hereto and their respective heirs, devisees, executors, administrators, successors and assigns, and may be cancelled, modified or amended only by a written instrument executed by both the SELLER and the BUYER. If two or more persons are named herein as BUYER their obligations hereunder shall be joint and several. The captions and marginal notes are used only as a matter of convenience and are not to be considered a part of this agreement or to be used in determining the intent of the parties to it.

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SELLER: _____
Print Name: **Dennis B. Costello, Tru**[redacted]
Taxpayer ID/Social Security No.: _____

SELLER _____
Print Name: **Paul K. Costello, Trustee**
Taxpayer ID/Social Security No._____

LEWIS STREET REALTY LLC
BUYER: By:_____
Print Name: **Anthony Marinella, Manager**
Taxpayer ID/Social Security No.: _____

BUYER: _____
Print Name:
Taxpayer ID/Social Security No. _____

BROKER(S)

Appendix A - Property Description (Costello)

26. MORTGAGE CONTINGENCY CLAUSE *(omit if not provided for in Offer to Purchase)*

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Print Name: **Dennis B. Costello, Trustee**
Taxpayer ID/Social Security No.:

SELLER: _____
Print Name: **Paul K. Costello, Trustee**
Taxpayer ID/Social Security No._____

LEWIS STREET REALTY LLC
BUYER: By: _____
Print Name: **Anthony Marinella, Manager**
Taxpayer ID/Social Security No.: _____

BUYER: _____
Print Name:
Taxpayer ID/Social Security No. _____

BROKER(S)

Appendix A - Property Description (Depoto/Brunelli)

STANDARD FORM PURCHASE & SALE AGREEMENT

1. PARTIES AND MAILING ADDRESSES *(fill in)*

As of the 31st day of August 2018

DONNA A. BRUNELLI of 8 Spring Street, Franklin, MA 02038; **RICHARD J. DEPOTO** of 825 Washington Street, Franklin, MA 02038; **JEAN M. BRUNEAULT, Personal Representative of the Estate of Anthony R. Depoto,** of 38 Orchard Street, Blackstone, MA 01504; **LAWRENCE BENEDETTO, Co-Executor/Personal Representative of the Estate of Edward J. Depoto,** of 211 Chestnut Street, Franklin, MA 02038 and **GERALD TULIS, Co-Executor/Personal Representative of the Estate of Edward J. Depoto,** of 33 Surrey Drive, Mansfield, MA 02048; hereinafter called the SELLER, agrees to SELL and
Lewis Street Realty LLC, a Massachusetts limited liability company with a principal place of business located at 28 Tia Place, P.O. Box 411, Franklin, MA 02038

2. DESCRIPTION *(fill in and include title reference)*

hereinafter called the BUYER or PURCHASER, agrees to BUY, upon the terms hereinafter set forth, the following described premises: **A certain parcel of land known as 0 Spring St., Franklin, MA 02038, more fully described at the Norfolk Registry District of the Land Court, Certificate of Title No. 117711, Book 589, Page 111.**
SEE ATTACHED ASSESSMENT AND SALES REPORT AND MAP.

3. BUILDINGS, STRUCTURES, IMPROVEMENTS, FIXTURES

(fill in or delete)

Included in the sale as a part of said premises are the buildings, structures, and improvements now thereon, and the fixtures belonging to the SELLER and used in connection therewith including, if any, all wall-to-wall carpeting, drapery rods, automatic garage door openers, venetian blinds, window shades, screens, screen doors, storm windows and doors, awnings, shutters, furnaces, heaters, heating equipment, stoves, ranges, oil and gas burners and fixtures appurtenant thereto, hot water heaters, plumbing and bathroom fixtures, garbage disposers, electric and other lighting fixtures, mantels, outside television antennas, fences, gates, trees, shrubs, plants and, ONLY IF BUILT IN, refrigerators, air conditioning equipment, ventilators, dishwashers, washing machines and dryers,

but excluding:

4. TITLE DEED *(fill in)*

* *Include here by specific reference any restrictions, easements, rights and obligations in party walls not included in (b), leases, municipal and other liens, other encumbrances, and make provision to protect SELLER against BUYER's breach of SELLER's covenants in leases, where necessary.*

Said premises are to be conveyed by a good and sufficient quitclaim deed running to the BUYER, or to the nominee designated by the BUYER by written notice to the SELLER at least seven (7) days before the deed is to be delivered as herein provided, and said deed shall convey a good and clear record and marketable title thereto, free from encumbrances, except

a. Provisions of existing building and zoning laws;
b. Existing rights and obligations in party walls which are not the subject of written agreement;
c. Such taxes for the then current year as are not due and payable on the date of the delivery of such deed;
d. Any liens for municipal betterments **recorded after the deed to the BUYER;**
e. Easements, restrictions and reservations of record, if any, so long as the same do not prohibit or materially interfere with the current use of said premises;

*f.

5. PLANS

If said deed refers to a plan necessary to be recorded therewith the SELLER shall deliver such plan with the deed in form adequate for recording or registration.

6 REGISTERED TITLE

In addition to the foregoing, if the title to said premises is registered, said deed shall be in form sufficient to entitle the BUYER to a Certificate of Title of said premises, and the SELLER shall deliver with said deed all instruments, if any, necessary to enable the BUYER to obtain such Certificate of Title.

7. PURCHASE PRICE *(fill in) space is allowed to spell out the amounts if desired*

The agreed purchase price for said premises is [redacted] of which

[redacted]

5. TIME FOR PERFORMANCE DELIVERY OF DEED *(fill in)*

Such deed is to be delivered at **10:00** a.m. on the first to occur of: (a) February 28, 2019 or (b) on the day that is set by BUYER in a written notice to SELLER delivered at least ten (10) days prior to the closing date set therein that a solar company has agreed to enter into a ground lease with BUYER. Provided that application has been filed on or before December 1, 2018 with the Town of Franklin seeking approval of the planned solar project and the solar company is making good faith, best efforts to obtain approvals in a prompt manner, Seller will agree to extend the closing to on or before September 1, 2019 and will grant up to two extensions of twelve (12) months and six (6) months, respectively. Said Closing shall take place at time and date set above at the Norfolk County Registry of Deeds unless otherwise agreed upon in writing. It is agreed that time is of the essence of this agreement.

9. POSSESSION AND CONDITION OF PREMISE *(attach a list of exceptions, if any)*

Full possession of said premises free of all tenants and occupants, except as herein provided, is to be delivered at the time of the delivery of the deed, said premises to be then (a) in the same condition as they now are, reasonable use and wear thereof excepted, and (b) not in violation of said building and zoning laws, and (c) in compliance with the provisions of any instrument referred to in clause 4 hereof. The BUYER shall be entitled personally to enter said premises prior to the delivery of the deed in order to determine whether the condition thereof complies with the terms of this clause.

10. EXTENSION TO PERFECT TITLE OR MAKE PREMISES CONFORM *(Change period of time if desired).*

If the SELLER shall be unable to give title or to make conveyance, or to deliver possession of the premises, all as herein stipulated, or if at the time of the delivery of the deed the premises do not conform with the provisions hereof, then ~~any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto, unless~~ the SELLER shall use reasonable efforts to remove any defects in title, or to deliver possession as provided herein, or to make the said premises conform to the provisions hereof, as the case may be, in which event the SELLER shall give written notice thereof to the BUYER at or before the time for performance hereunder, and thereupon the time for performance hereof shall be extended for a period of thirty (30) days.

11. FAILURE TO PERFECT TITLE OR MAKE PREMISES CONFORM, etc.

If at the expiration of the extended time the SELLER shall have failed so to remove any defects in title, deliver possession, or make the premises conform, as the case may be, all as herein agreed, or if at any time during the period of this agreement or any extension thereof, the holder of a mortgage on said premises shall refuse to permit the insurance proceeds, if any, to be used for such purposes, then any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto.

12. BUYER's ELECTION TO ACCEPT TITLE

The BUYER shall have the election, at either the original or any extended time for performance, to accept such title as the SELLER can deliver to the said premises in their then condition and to pay therefore the purchase price without deduction, in which case the SELLER shall convey such title, except that in the event of such conveyance in accord with the provisions of this clause, if the said premises shall have been damaged by fire or casualty insured against, then, at the BUYER's option, the SELLER shall, unless the SELLER has previously restored the premises to their former condition, either

a. pay over or assign to the BUYER, on delivery of the deed, all amounts recovered or recoverable on account of such insurance, less any amounts reasonably expended by the SELLER for any partial restoration, or
b. if a holder of a mortgage on said premises shall not permit the insurance proceeds or a part thereof to be used to restore the said premises to their former condition or to be so paid over or assigned, give to the BUYER a credit against the purchase price, on delivery of the deed, equal to said amounts so recovered or recoverable and retained by the holder of the said mortgage less any amounts reasonably expended by the SELLER for any partial restoration.

13. ACCEPTANCE OF DEED

The acceptance and recording of a deed by the BUYER or his nominee, as the case may be, shall be deemed to be a full performance and discharge of every agreement and obligation herein contained or expressed, except such as are, by the terms hereof, to be performed after the delivery of said deed.

14. USE OF MONEY TO CLEAR TITLE

To enable the SELLER to make conveyance as herein provided, the SELLER may, at the time of delivery of the deed, use the purchase money or any portion thereof to clear the title of any or all encumbrances or interests, provided that all instruments so procured are recorded simultaneously with the delivery of said deed.

15. INSURANCE **Insert amount (list additional types of insurance and amounts as agreed)*

Until the delivery of the deed, the SELLER shall maintain insurance on said premises as follows:

Type of Insurance	*Amount of Coverage*
a. Fire and Extended Coverage	*$ **As Presently Insured**
b.	*$

All risk to remain with SELLER until recording of deed to BUYER

Appendix A - Property Description (Depoto/Brunelli)

16 ADJUSTMENTS
(list operating expenses, if any, or attach schedule)

~~Collected rents, mortgage interest, water and sewer use charges, operating expenses (if any) according to the schedule attached hereto or set forth below and~~ taxes for the then current fiscal year, shall be apportioned ~~and fuel value shall be a buyout~~, as of the day of performance of this agreement and the net amount thereof shall be added to or deducted from, as the case may be, the purchase price payable by the BUYER at the time of delivery of the deed. ~~Uncollected rents for the current rental period shall be apportioned if and when collected by either party.~~

17. ADJUSTMENT OF UNASSESSED AND ABATED TAXES

If the amount of said taxes is not known at the time of the delivery of the deed, they shall be apportioned on the basis of the taxes assessed for the preceding fiscal year, with a reapportionment as soon as the new tax rate and valuation can be ascertained; and, if the taxes which are to be apportioned shall thereafter be reduced by abatement, the amount of such abatement, less the reasonable cost of obtaining the same, shall be apportioned between the parties, provided that neither party shall be obligated to institute or prosecute proceedings for an abatement unless otherwise herein agreed.

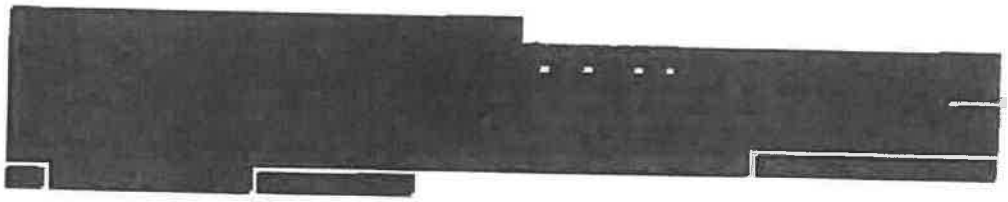
18. BROKER'S FEE
(fill in fee with dollar amount or percentage; also name of Brokerage firm(s))

~~A Broker's fee for professional services of ——— is due from the SELLER to the Broker(s) herein, but if the SELLER pursuant to the terms of clause 21 hereof retains the deposit made hereunder by the BUYER, said Broker(s) shall be entitled to receive from the SELLER an amount equal to one half the amount so retained or an amount equal to the Broker's fee for professional services according to this contract, whichever is the lesser.~~

19. BROKER(S) WARRANTY
(fill in name)

~~The Broker(s) named herein warrant(s) that the Broker(s) is(are) duly licensed as such by the Commonwealth of Massachusetts.~~

20. DEPOSIT
(fill in name)



21. BUYER's DEFAULT; DAMAGES

If the BUYER shall fail to fulfill the BUYER'S agreements herein, all deposits made hereunder by the BUYER shall be retained by the SELLER as liquidated damages ~~unless within thirty days after the time for performance of this agreement or any extension hereof, the SELLER otherwise notifies the BUYER in writing~~ **which shall be the Seller's sole remedy in law and in equity.**

22. RELEASE BY HUSBAND OR WIFE

The SELLER'S spouse hereby agrees to join in said deed and to release and convey all statutory and other rights and interests in said premises.

23. BROKER AS PARTY

The Broker(s) named herein join(s) in this agreement and become(s) a party hereto, insofar as any provisions of this agreement expressly apply to the Broker(s), and to any amendments or modifications of such provisions to which the Broker(s) agree(s) in writing.

24. LIABILITY OF TRUSTEE, SHAREHOLDER, BENEFICIARY, etc.

If the SELLER or BUYER executes this agreement in a representative or fiduciary capacity, only the principal or the estate represented shall be bound, and neither the SELLER or BUYER so executing, nor any shareholder or beneficiary of any trust, shall be personally liable for any obligation, express or implied, hereunder.

25. WARRANTIES AND REPRESENTATIONS
(fill in) if none state "none"; if any listed, indicate by whom each warranty or representation was made

The BUYER acknowledges that the BUYER has not been influenced to enter into this transaction nor has he relied upon any warranties or representations not set forth or incorporated in this agreement or previously made in writing, except for the following additional warranties and representations, if any, made by either the SELLER or the Broker(s): **NONE, except as set forth in this agreement.**

Appendix A - Property Description (Depoto/Brunelli)

26. MORTGAGE CONTINGENCY CLAUSE *(omit if not provided for in Offer to Purchase)*

In order to help finance the acquisition of said premises, the BUYER shall apply for a conventional bank or other institutional mortgage loan of [redacted] at prevailing rates, terms and conditions. If, despite the BUYER'S diligent efforts, a commitment for such loan cannot be obtained on or before thirty (30) days prior to closing the BUYER may terminate this agreement by written notice to the SELLER and/or the Broker(s), as agent(s) for the SELLER, prior to the expiration of such time, whereupon any payments made under this agreement shall be forthwith refunded and all other obligations of the parties hereto shall cease and this agreement shall be void without recourse to the parties hereto. ~~In no event will the BUYER be deemed to have used diligent efforts to obtain such commitment unless the BUYER submits a complete mortgage loan application conforming to the foregoing provisions on or before~~

27. CONSTRUCTION OF AGREEMENT

This instrument, executed in multiple counterparts, is to be construed as a Massachusetts contract, is to take effect as a sealed instrument, sets forth the entire contract between the parties, is binding upon and inures to the benefit of the parties hereto and their respective heirs, devisees, executors, administrators, successors and assigns, and may be cancelled, modified or amended only by a written instrument executed by both the SELLER and the BUYER. If two or more persons are named herein as BUYER their obligations hereunder shall be joint and several. The captions and marginal notes are used only as a matter of convenience and are not to be considered a part of this agreement or to be used in determining the intent of the parties to it.

28. LEAD PAINT LAW

The parties acknowledge that, under Massachusetts law, whenever a child or children under six years of age resides in any residential premises in which any paint, plaster or other accessible material contains dangerous levels of lead, the owner of said premises must remove or cover said paint, plaster or other material so as to make it inaccessible to children under six years of age.

29. SMOKE & CARBON MONOXIDE DETECTORS

The SELLER shall, at the time of the delivery of the deed, deliver a certificate from the fire department of the city or town in which said premises are located stating that said premises have been equipped with approved smoke and carbon monoxide detectors in conformity with applicable law.

30. ADDITIONAL PROVISIONS

The initialed riders, if any, attached hereto, are incorporated herein by reference.

~Subject to Clear Title;
~Subject to Buyer obtaining all permits/approvals;
~Subject to Buyer being able to operate a 6 Megawatt Solar Farm; and
~Subject to Buyer closing on all three parcels (0 Spring Street, 0 Spring St., 0 Peppermill Lane) See attached map.
See Rider A attached hereto and incorporated herein.
See Rider B, Collateral Assignment, attached hereto and incorporated herein.

FOR RESIDENTIAL PROPERTY CONSTRUCTED PRIOR TO 1978, BUYER MUST ALSO HAVE SIGNED LEAD PAINT "PROPERTY TRANSFER NOTIFICATION CERTIFICATION"

NOTICE: This is a legal document that creates binding obligations. If not understood, consult an attorney.

SELLER: _____
Print Name: **Donna A. Brunnelli**

SELLER _____
Print Name: **Richard J. Depoto**

ESTATE OF ANTHONY R. DEPOTO
SELLER By: _____
Print Name: **Jean M. Bruneault, Personal Representative**

ESTATE OF EDWARD J. DEPOTO
SELLER: By: _____
Print Name: **Lawrence Benedetto, Co-Executor/Personal Representative**
SELLER: By: _____
Print Name: **Gerald Tulis, Co-Executor/Personal Representative**

LEWIS STREET REALTY LLC
BUYER: By: _____
Print Name: **Anthony Marinella, Manager**

BUYER: _____
Print Name:

BROKER(S)

Appendix A - Property Description (Depoto/Brunelli)

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SELLER _____
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SELLER: By: _____
Print Name: **Jean M. Bruneault, Personal Representative**

ESTATE OF EDWARD J. DEPOTO
SELLER: By: _____
Print Name: **Lawrence Benedetto, Co-Executor/Personal Representative**
SELLER: By: Gerald Tulis
Print Name: **Gerald Tulis, Co-Executor/Personal Representative**

LEWIS STREET REALTY LLC
BUYER: By: _____
Print Name: **Anthony Marinella, Manager**

BUYER: _____
Print Name:

BROKER(S)

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-Subject to Buyer being able to operate a 6 Megawatt Solar Farm; and
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SELLER: Donna Brunelli
Print Name: Donna A. Brunelli

SELLER: Richard J. Depoto
Print Name: Richard J. Depoto

LEWIS STREET REALTY LLC
BUYER: By: _____
Print Name: Anthony Marinella, Manager

BUYER: _____
Print Name:

ESTATE OF ANTHONY R. DEPOTO
SELLER: By: Joan M. Bruneault
Print Name: Joan M. Bruneault, Personal Representative

ESTATE OF EDWARD J. DEPOTO
SELLER: By: _____
Print Name: Lawrence Benedetto, Co-Executor/Personal Representative
SELLER: By: _____
Print Name: Gerald Tulis, Co-Executor/Personal Representative

BROKER(S)

APPENDIX B

AGREEMENT REGARDING CONSENT TO COLLATERAL ASSIGNMENT OF REAL ESTATE PURCHASE AND SALE AGREEMENT

This Agreement Regarding Consent to Collateral Assignment of Real Estate Purchase and Sale Agreement ("Agreement") entered int this __ day of _____, 2018, by and between _____ ("Seller"), Lewis Street Realty, LLC ("Lewis Street") and Spring Street Renewables, LLC ("Spring Street") (each a "Party" and collectively, the "Parties").

WHEREAS, Seller and Lewis Street entered into that certain Real Estate Purchase and Sale Agreement dated _____ __, 201_, attached hereto as Exhibit A (the "P/S Agreement") for the purchase and sale of certain real property owned by Seller, as more fully identified in Exhibit A (the "Property"); and

WHEREAS, Lewis Street and Spring Street entered into that certain Amended and Restated Lease Option Agreement dated _____ __, 2018 (the "Lease Option"); and

WHEREAS, Spring Street wishes to be assured that the Property remains available for development in the event that Lewis Street is unable to obtain ownership of the Property pursuant to the P/S Agreement; and

WHEREAS, Spring Street wishes to perform such due diligence and obtain such permits and governmental approvals as are necessary to develop, construct, operate and maintain a solar powered electric generation facility on the Property;

NOW THEREFOR, as an inducement to Spring Street to exercise the Lease Option granted by Lewis Street to Spring Street with respect to the Property, and in consideration of One Dollar ($1.00) paid by Spring Street, the receipt of which is hereby acknowledged, the Parties hereby agree as follows:

1. Seller agrees and consents to the collateral assignment to Spring Street Renewables, LLC ("Spring Street") of the P/S Agreement, and to Spring Street's use of the property which is the subject of the P/S Agreement for permitting and zoning activities as more fully described herein. If an Event of default under any of the Lease Documents occurs, Seller agrees to continue to perform under the P/S Agreement according to its terms if requested by Spring Street or its designee.

2. Spring Street or its designee may enforce the P/S Agreement with the same effect as if enforced by Lewis Street. Spring Street or its designee may perform the obligations of Lewis Street under the P/S Agreement and Seller agrees to accept such performance in satisfaction of Lewis Street's obligations under the P/S Agreement.

3. Seller agrees not to terminate the P/S Agreement on account of any Lewis Street default without giving prior written notice to Spring Street and thirty (30) days to cure the default or to declare Lewis Street in default under the Lease Documents and to perform under the P/S Agreement. If Spring Street elects to close on the Property under the P/S Agreement, Seller agrees

not to terminate the P/S Agreement so long as Lewis Street's defaults under the P/S Agreement are cured by Spring Street or its designee within a reasonable time. Seller agrees that Spring Street has no obligation to cure any Lewis Street default under the P/S Agreement.

4. Seller agrees that Spring Street does not assume any of Lewis Street's obligations under the P/S Agreement unless and until Spring Street gives to Seller written notice that it has affirmatively exercised its rights to acquire the Property under the P/S Agreement upon or after a Lewis Street Event of default under any of the Lease Documents or under the P/S Agreement. After having been provided any such notice, Seller shall tender its performance of the P/S Agreement to Spring Street or Spring Street's designee.

5. Seller represents and warrants to Spring Street that (i) the P/S Agreement is a valid and enforceable agreement binding upon the Seller, (ii) neither Seller nor Lewis Street is in default under the P/S Agreement, and (iii) all P/S Agreement conditions and agreements have been performed as required except those not due to be performed until after the date of this Consent.

6. Seller acknowledges that Spring Street intends to develop, construct and operate a solar photovoltaic facility (the "Facility") on all or a portion of the Property. Spring Street shall perform due diligence to evaluate utility interconnection and viability of developing the Facility on the Property. Prior to Lewis Street or Spring Street obtaining ownership of the Property pursuant to the P/S Agreement, Seller shall permit Spring Street or Spring Street's employees, agents and contractors free ingress and egress to the Property to conduct tests and investigations, commence the interconnection process, and perform such similar activities as Spring Street may deem reasonably necessary (collectively, the "Inspections"), at Spring Street's sole cost and expense. The scope, sequence, and timing of the Inspections shall be at Spring Street's reasonable discretion, provided that Spring Street shall make reasonable efforts to coordinate and schedule such Inspections so as not to unreasonably interfere with Seller's or Seller's tenant's use and enjoyment of the Property. Spring Street and its employees, agents and contractors shall have the right to bring the necessary vehicles and equipment onto the Property to conduct the Inspections. Seller shall cooperate with Spring Street during the Inspections and Permitting Activities including providing information about the Property characteristics, taxes, history and encumbrances.

7. Spring Street is authorized, in the name of Seller, Spring Street or both, as Spring Street may deem to be necessary or appropriate, to file with such federal, state and local authorities as Spring Street deems appropriate (i) one or more applications to obtain any zoning relief regarding the Property or portions thereof as may be necessary and/or desirable to develop, construct and operate the Facility on the Property; (ii) one or more applications to obtain construction, use or occupancy permits for the Facility or any portion thereof, and (iii) the notice require by Massachusetts General Laws, Chapter 61 to remove the Property from Chapter 61 classification (collectively, the "Permitting Activities"). Seller shall cooperate in good faith with Spring Street and shall execute any such applications, including without limitation applications for a Massachusetts Department of Environmental Protection Order of Conditions and a Franklin Planning Board Special Permit, within fifteen (15) days of Spring Street's request, and shall not oppose or interfere with Spring Street in such regard. Seller is not obligated to incur expense in connection with such efforts.

8. Spring Street shall indemnify, defend and hold Seller harmless against any loss or damage for personal injury or physical damage to the Property resulting from the Inspections or the Permitting Activities, except that Spring Street shall not be obligated to indemnify Seller for any loss to the extent such loss is due to the negligence or willful misconduct of Seller; or for a statutory violation by, or punitive damages against, Seller.

9. From time to time and at any time at and after the execution of this Agreement, each Party shall execute, acknowledge and deliver such documents, and assurances, reasonably requested by another and shall take any other action consistent with the terms of this Agreement that may be reasonably requested by the other for the purpose of effecting or confirming (but not altering or expanding) any of the transactions contemplated hereby. No Party shall unreasonably withhold, condition or delay its compliance with any reasonable request made pursuant to this Agreement.

10. This Agreement may be executed in several counterparts, each of which shall constitute an original and all of which shall constitute the same agreement. Signed email transmissions of this Agreement shall be considered an original of the Agreement and shall have the same effect and force as signed hard-copy originals of the Agreement.

IN WITNESS WHEREOF, the undersigned have entered into this Agreement as of the date first written above.

SPRING STREET

Spring Street Renewables, LLC

By: Nexamp Capital, LLC,
its sole member

By: Nexamp, Inc.,
its sole member

By: _____
Name: Zaid Ashai/Robert E. Pantano
Title: **Chief Executive Officer/ Chief Operating Officer**

LEWIS STREET

Lewis Street Realty LLC

By: _____
Name: Anthony Marinella
Title: Manager

SELLER

_____

_____

[Acknowledgements to follow]

Acknowledgements to Agreement Regarding Consent to Collateral Assignment of Real Estate Purchase and Sale Agreement

COMMONWEALTH OF MASSACHUSETTS)
COUNTY OF_____ _____ _____)

On this ____day of _____, 2018, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which was _____, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily as his free act and deed for its stated purpose as authorized representative of **Lewis Street Realty, LLC**, a limited liability company.

_____
Notary Public

My commission expires:

COMMONWEALTH OF MASSACHUSETTS)
COUNTY OF_____)

On this ____day of _____, 2018, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which was _____, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that he signed it voluntarily as his free act and deed for its stated purpose as authorized representative of **Spring Street Renewables, LLC**, a limited liability company.

_____
Notary Public

My commission expires:

COMMONWEALTH OF MASSACHUSETTS)
COUNTY OF_____)

On this _____ day of _____, 2018, before me, the undersigned notary public, personally appeared _____, proved to me through satisfactory evidence of identification, which were _____, to be the person whose name is signed on the preceding or attached document, and acknowledged to me that she/he signed it voluntarily for its stated purpose and as her/his free act and deed.

_____
Notary Public

My Commission Expires: _____

Exhibit A

[see Attached]

Liability Insurance

CERTIFICATE OF LIABILITY INSURANCE

DATE (MM/DD/YYYY): 12/29/2017

THIS CERTIFICATE IS ISSUED AS A MATTER OF INFORMATION ONLY AND CONFERS NO RIGHTS UPON THE CERTIFICATE HOLDER. THIS CERTIFICATE DOES NOT AFFIRMATIVELY OR NEGATIVELY AMEND, EXTEND OR ALTER THE COVERAGE AFFORDED BY THE POLICIES BELOW. THIS CERTIFICATE OF INSURANCE DOES NOT CONSTITUTE A CONTRACT BETWEEN THE ISSUING INSURER(S), AUTHORIZED REPRESENTATIVE OR PRODUCER, AND THE CERTIFICATE HOLDER.

IMPORTANT: If the certificate holder is an ADDITIONAL INSURED, the policy(ies) must have ADDITIONAL INSURED provisions or be endorsed. If SUBROGATION IS WAIVED, subject to the terms and conditions of the policy, certain policies may require an endorsement. A statement on this certificate does not confer rights to the certificate holder in lieu of such endorsement(s).

PRODUCER	CONTACT NAME:	
Willis of Massachusetts, Inc. c/o 26 Century Blvd P.O. Box 305191 Nashville, TN 372305191 USA	PHONE (A/C, No, Ext): 1-877-945-7378	FAX (A/C, No): 1-888-467-2378
	E-MAIL ADDRESS: certificates@willis.com	

INSURED	INSURER(S) AFFORDING COVERAGE	NAIC #
Nexamp, Inc. 4 LIBERTY SQUARE BOSTON, MA 02109 USA	INSURER A: Axis Specialty Europe SE	C1783
	INSURER B: Ohio Security Insurance Company	24082
	INSURER C: Granite State Insurance Company	23809
	INSURER D: Zurich American Insurance Company	16535
	INSURER E:	
	INSURER F:	

COVERAGES **CERTIFICATE NUMBER:** W5015860 **REVISION NUMBER:**

THIS IS TO CERTIFY THAT THE POLICIES OF INSURANCE LISTED BELOW HAVE BEEN ISSUED TO THE INSURED NAMED ABOVE FOR THE POLICY PERIOD INDICATED. NOTWITHSTANDING ANY REQUIREMENT, TERM OR CONDITION OF ANY CONTRACT OR OTHER DOCUMENT WITH RESPECT TO WHICH THIS CERTIFICATE MAY BE ISSUED OR MAY PERTAIN, THE INSURANCE AFFORDED BY THE POLICIES DESCRIBED HEREIN IS SUBJECT TO ALL THE TERMS, EXCLUSIONS AND CONDITIONS OF SUCH POLICIES. LIMITS SHOWN MAY HAVE BEEN REDUCED BY PAID CLAIMS.

INSR LTR	TYPE OF INSURANCE	ADDL INSD	SUBR WVD	POLICY NUMBER	POLICY EFF (MM/DD/YYYY)	POLICY EXP (MM/DD/YYYY)	LIMITS	
A	X COMMERCIAL GENERAL LIABILITY CLAIMS-MADE [X] OCCUR GEN'L AGGREGATE LIMIT APPLIES PER: X POLICY [X] PRO-JECT [ ] LOC OTHER:			3791010216EN	12/31/2017	12/31/2018	EACH OCCURRENCE DAMAGE TO RENTED PREMISES (Ea occurrence) MED EXP (Any one person) PERSONAL & ADV INJURY GENERAL AGGREGATE PRODUCTS - COMP/OP AGG	$ 1,000,000 $ 100,000 $ $ 2,000,000 $ 2,000,000 $ 2,000,000
B	AUTOMOBILE LIABILITY ANY AUTO OWNED AUTOS ONLY X SCHEDULED AUTOS X HIRED AUTOS ONLY X NON-OWNED AUTOS ONLY			BAS(18)58489128	12/31/2017	12/31/2018	COMBINED SINGLE LIMIT (Ea accident) BODILY INJURY (Per person) BODILY INJURY (Per accident) PROPERTY DAMAGE (Per accident)	$ 1,000,000 $ $ $
A	X UMBRELLA LIAB X OCCUR EXCESS LIAB CLAIMS-MADE DED X RETENTION $ 0			3791010316EN	12/31/2017	12/31/2018	EACH OCCURRENCE AGGREGATE	$ 5,000,000 $ 5,000,000
C	WORKERS COMPENSATION AND EMPLOYERS' LIABILITY ANYPROPRIETOR/PARTNER/EXECUTIVE OFFICER/MEMBER EXCLUDED? Y/N: No (Mandatory in NH) If yes, describe under DESCRIPTION OF OPERATIONS below	N/A		WC001-60-5334	08/10/2017	08/10/2018	X PER STATUTE OTH-ER E.L. EACH ACCIDENT E.L. DISEASE - EA EMPLOYEE E.L. DISEASE - POLICY LIMIT	$ 1,000,000 $ 1,000,000 $ 1,000,000
D	Professional Liability			EOC 0398821-00	12/31/2016	01/07/2018	Each Claim Aggregate	$2,000,000.00 $2,000,000.00

DESCRIPTION OF OPERATIONS / LOCATIONS / VEHICLES (ACORD 101, Additional Remarks Schedule, may be attached if more space is required)

CERTIFICATE HOLDER

For Information Only

CANCELLATION

SHOULD ANY OF THE ABOVE DESCRIBED POLICIES BE CANCELLED BEFORE THE EXPIRATION DATE THEREOF, NOTICE WILL BE DELIVERED IN ACCORDANCE WITH THE POLICY PROVISIONS.

AUTHORIZED REPRESENTATIVE

Julie M Powers

SR ID: 15476786 BATCH: 554693

NGRID Interconnection Application (Franklin)

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application

Contact Information (TYPE or PRINT): Date Prepared: _____

Legal Name and Address of Interconnecting Customer

Interconnecting Customer: Nexamp Capital, LLC Contact Person: Alan Clapp

Mailing Address: 4 Liberty Square, 3rd floor

City: Boston State: MA Zip Code: 02109

Telephone (Daytime): 617-431-1440 x 119 (Evening): _____

Facsimile Number: _____ E-Mail Address: aclapp@nexamp.com

Ownership Information (include % ownership by any electric utility): 100% customer

Site Control: Does the Interconnecting Customer have site control? ☒ Yes ☐ No

Confidentiality Statement: "I agree to allow information regarding the processing of my application (without my name and address) to be reviewed by the Massachusetts DG Working Group that is exploring ways to further expedite future interconnections." ☒ Yes ☐ No

Group Study Agreement: "I understand and agree if my project becomes part of a Group Study, the Company is authorized to share my contact information and project details with other parties that are also involved in the Group Study." ☒ Yes ☐ No

Host Retail Customer Contact Information (complete any that are different than Interconnecting Customer information above):

Retail Customer: _____ Contact Person: _____

E-Mail Address: _____ Telephone: _____

Landowner Name (if neither Interconnecting Customer nor Customer): _____

Landowner email: _____ Landowner telephone: _____

Landowner Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Alternative Contact Information (e.g., system installation contractor or coordinating company, if appropriate):

Company Name: Nexamp Contact Person: _____

Mailing Address: 4 Liberty Square, 3rd floor

City: Boston State: MA Zip Code: 02109

Telephone (Daytime): _____ (Evening): _____

Facsimile Number: _____ E-Mail Address: interconnections@nexamp.com

Electrical Contractor Contact Information (if appropriate):

Name: _____ E-mail Address: _____

Mailing Address: _____ Telephone: _____

City: _____ State: _____ Zip Code: _____

Interconnection Seminars: "I have attended one of the utility-hosted Interconnection Seminars." (Recommended) ☒ Yes ☐ No

Interconnection Tariff: "I have reviewed the entire MDPU 1248 Standards for Interconnection of DG." (Recommended) ☒ Yes ☐ No

Facility Information (TYPE or PRINT):

Please provide all Pre-Application Reports (either mandatory or optional as per MDPU 1248) as attachments.

Address of Facility: 30 Spring Street

City: Franklin State: MA Zip Code: 02038

Single Parcel: Will the Facility be constructed on a single parcel of land? ☐ Yes ☐ No

Authorized/Proposed generation capacity already exists (check all that apply):

☐ On Current Account ☐ On Same Legal Parcel of Land ☐ In Same Building/Structure

If any apply, include existing generation capacity on design diagrams, and provide Application Number(s): _____

Electric Service Company: National Grid Account Number: _____ Meter Number: _____

Work Request Number (For Upgrades or New Service): _____ MTC ID: _____

System Design Capacity: Nominal _____ (kW_{AC}) _____ (kVA) Maximum _____ (kW_{AC}) 5000 (kVA)

For Solar PV provide the DC-STC rating: 6632.82 (kW_{DC})

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application

Prime Mover: ☒ Photovoltaic ☐ Reciprocating Engine ☐ Fuel Cell ☐ Turbine ☐ Other: _____

Energy Source: ☒ Solar ☐ Wind ☐ Hydro ☐ Diesel ☐ Natural Gas ☐ Fuel Oil ☐ Other: _____

IEEE 1547.1 (UL 1741) Listed? ☐ Yes ☐ No

1) Generating Unit Type 1

Manufacturer: SMA Model Name and Number: Sunny Central 2500EV-US Quantity: 2

AC Rating:
Nominal: _____ (kW) _____ (kVA) _____ (AC Volts)
Maximum: _____ (kW) _____ (kVA) _____ (AC Volts) ☐ Single or ☐ Three Phase

2) Generating Unit Type 2 (if applicable)

Manufacturer: _____ Model Name and Number: _____ Quantity: _____

AC Rating:
Nominal: _____ (kW) _____ (kVA) _____ (AC Volts)
Maximum: _____ (kW) _____ (kVA) _____ (AC Volts) ☐ Single or ☐ Three Phase

3) Generating Unit Type 3 (if applicable)

Manufacturer: _____ Model Name and Number: _____ Quantity: _____

AC Rating:
Nominal: _____ (kW) _____ (kVA) _____ (AC Volts)
Maximum: _____ (kW) _____ (kVA) _____ (AC Volts) ☐ Single or ☐ Three Phase

Does this project need an air quality permit from the DEP? ☐ Yes ☒ No ☐ Not Sure

If "Yes", have you applied for it? ☐ Yes ☐ No

Planning to Export Power? ☒ Yes ☐ No Is this a Cogeneration Facility? ☐ Yes ☒ No

Anticipated Export Power Purchaser: _____

Export Form? ☐ Qualifying Facility (QF) ☒ Net Metering ☐ Other (explain): _____

Estimated Install Date: _____ Estimated. In-Service Date: _____

Agreement Need By: _____

If net metering, please refer to Schedule Z of the Standards for Interconnection of Distributed Generation. Please note that if under the public cap, all off-takers must be a Municipality or other Governmental Entity (as defined in 220 C.M.R. 18.02) and therefore be certified by the DPU.

Application Process

Interconnecting Customer Signature:

"I am opting to forego the Expedited Process. Please review this application under the Standard Process." ☐ Yes ☐ No

I hereby certify that, to the best of my knowledge, all of the information provided in this application is true:

Signature: _____ Title: _____ Date: _____

Please attach any documentation provided by the inverter manufacturer describing the inverter's UL 1741 listing.

All Application Materials Received (For Company use only):

The information provided in this application is complete, all attachments and supplemental application materials have been received, and the application may proceed to the initial/screening review stage of the interconnection process:

Signature: _____ Title: _____ Date: _____

Application ID number: _____

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application

Generating Facility Technical Detail

Information on components of the generating facility that are currently Listed

	Equipment Type	Manufacturer	Model	National Standard
1.				
2.				
3.				
4.				
5.				
6.				

Total Number of Generating Units in Facility? _____

Generator Unit Power Factor Rating: _____

Max Adjustable Leading Power Factor? _____ Max Adjustable Lagging Power Factor? _____

Generator Characteristic Data (for all inverter-based machines)

Max Design Fault Contribution Current? _____ ☐ Instantaneous or ☐ RMS

Harmonics Characteristics: _____

Start-up power requirements: _____

Generator Characteristic Data (for all rotating machines)

Rotating Frequency: _____ (rpm) Neutral Grounding Resistor (If Applicable): _____

Additional Information for Synchronous Generating Units

Synchronous Reactance, Xd: _____ (PU) Transient Reactance, X'd: _____ (PU)

Subtransient Reactance, X"d: _____ (PU) Neg Sequence Reactance, X2: _____ (PU)

Zero Sequence Reactance, Xo: _____ (PU) kVA Base: _____ (PU)

Field Voltage: _____ (Volts) Field Current: _____ (Amps)

Additional information for Induction Generating Units

Rotor Resistance, Rr: _____ Stator Resistance, Rs: _____

Rotor Reactance, Xr: _____ Stator Reactance, Xs: _____

Magnetizing Reactance, Xm: _____ Short Circuit Reactance, Xd": _____

Exciting Current: _____ Temperature Rise: _____

Frame Size: _____

Total Rotating Inertia, H: _____ Per Unit on kVA Base: _____

Reactive Power Required In Vars (No Load): _____

Reactive Power Required In Vars (Full Load): _____

Additional information for Induction Generating Units that are started by motoring

Motoring Power: _____(kW) Design Letter: _____

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application

Interconnection Equipment Technical Detail Date: _____

Will a transformer be used between the generator and the point of interconnection? ☐ Yes ☐ No

Will the transformer be provided by Interconnecting Customer? ☐ Yes ☐ No

Transformer Data (if applicable, for Interconnecting Customer-Owned Transformer):

Nameplate Rating: _____ (kVA) ☐ Single or ☐ Three Phase

Transformer Impedance: _____ (%) on a _____ kVA Base

If Three Phase:

Transformer Primary: _____ (Volts) ☐ Delta ☐ Wye ☐ Wye-Grounded ☐ Other: _____

Transformer Secondary: _____ (Volts) ☐ Delta ☐ Wye ☐ Wye-Grounded ☐ Other: _____

Transformer Fuse Data (if applicable, for Interconnecting Customer-Owned Fuse):

(Attach copy of fuse manufacturer's Minimum Melt & Total Clearing Time-Current Curves)

Manufacturer: _____ Type: _____ Size: _____ Speed: _____

Interconnecting Circuit Breaker (if applicable):

Manufacturer: _____ Type: _____ Load Rating: _____(Amps)

Interrupting Rating: _____ Trip Speed: _____ (Cycles)

Interconnection Protective Relays (if applicable):

If microprocessor-controlled, List of Functions and Adjustable Setpoints for the protective equipment or software:

	Setpoint Function	Minimum	Maximum
1.			
2.			
3.			
4.			
5.			
6.			

If discrete components (Enclose copy of any proposed Time-Overcurrent Coordination Curves):

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Manufacturer: _____ Type: _____ Style/Catalog No.: _____ Proposed Setting: _____

Current Transformer Data (if applicable):

(Enclose copy of Manufacturer's Excitation & Ratio Correction Curves)

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____

Potential Transformer Data (if applicable):

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____

Manufacturer: _____ Type: _____ Accuracy Class: _____ Proposed Ratio Connection: _____

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application

General Technical Details

Submit all of the customer's Interconnection Application materials and proposed design diagrams using the following process:

1. Email the following materials to National Grid at Distributed.Generation@nationalgrid.com:
   a. ☐ P.E.-stamped One-Line Diagram (and ☐ Three-Line Diagram if applicable), including:
      i. ☐ Schematics for all (internal & redundant) protection and control circuits, relay current circuits, relay potential circuits, and alarm/monitoring circuits (if applicable)
   b. ☐ Site Plan, which indicates the precise physical location of the proposed:
      i. ☐ Generating Facility
      ii. ☐ AC Utility Disconnect Switch
      iii. ☐ All meters (utility- and customer-owned)
      iv. ☐ Related interconnection equipment
   c. ☐ Technical Specifications (pdf files only)
   d. ☐ Exhibit C (this form) – completed and signed (available on the website)
   e. ☐ Legal Information Document – completed (available on the website)
   f. ☐ Schedule Z (net metering only) – completed, initialed, and signed (available on the website)
   g. ☐ Copy of electric bill (if applicable)
   h. ☐ Copy of any Pre-Application Reports related to this application (if applicable)
   i. ☐ Copy of Interconnection Application fee check
   j. ☐ Any other information pertinent to this Interconnection Application (if applicable)
2. Mail the ☐ Interconnection Application fee check and the ☐ first two pages of the signed copy of this Interconnection Application form to:

   National Grid
   Attn: Distributed Generation
   40 Sylvan Rd
   Waltham, MA 02451

Note: The Schedule Z may be updated as needed at any point prior to the Authorization to Interconnect.

Refer to National Grid's Distributed Generation website for more detailed instructions:

Massachusetts:

Residential: http://www.nationalgridus.com/masselectric/home/energyeff/distributed_generation.asp

Commercial: http://www.nationalgridus.com/masselectric/business/energyeff/distributed_generation.asp

Nantucket:

Residential: http://www.nationalgridus.com/nantucket/home/energyeff/distributed_generation.asp

Commercial: http://www.nationalgridus.com/nantucket/business/energyeff/distributed_generation.asp

Massachusetts Electric Company & Nantucket Electric Company (d/b/a National Grid)
M.D.P.U. 1320

Exhibit E -Impact Study Agreement

This Agreement, dated 08/13/2018 is entered into by and between

Nexamp Interconnections

("Interconnecting Customer") and National Grid ("Company"), for the purpose of setting forth the terms, conditions and costs for conducting an Impact Study relative to the Standard Process as defined in Section 1.0 and outlined in Section 3.0

of the Interconnection Tariff. This Impact Study pertains Application Number

00185866 (the Interconnecting

Customer's application ID number). Terms used herein without definition shall have the meanings set forth in Section 1.2 of the Interconnection Tariff which is hereby incorporated by reference.

1) The Interconnecting Customer agrees to provide, in a timely and complete manner, all additional information and technical data necessary for the Company to conduct the Impact Study not already provided in the Interconnecting Customer's application.

2) All work pertaining to the Impact Study that is the subject of this Agreement will be approved and coordinated only through designated and authorized representatives of the Company and the Interconnecting Customer. Each party shall inform the other in writing of its designated and authorized representative, if different than what is in the application.

3) Where there are other potentially Affected Systems, and no single Party is in a position to prepare an Impact Study covering all potentially Affected Systems, the Company will coordinate but not be responsible for the timing of any additional studies required to determine the impact of the interconnection request on other potentially Affected Systems. The Interconnecting Customer will be directly responsible to the potentially Affected System operators for all costs of any additional studies required to evaluate the impact of the interconnection on the potentially Affected Systems. The Company will not proceed with this Impact Study without the Interconnecting Customer's consent to have the other studies conducted. To the extent any studies or System Modifications are required; all associated agreements will be between the Affected System operator and the Interconnecting Customer.

4) If the Company determines, in accordance with Good Utility Practice, that the System Modifications to the Company EPS are not substantial, the Impact Study will determine the scope and cost of the modifications. If the Company determines, in accordance with Good Utility Practice, that the System Modifications to the Company EPS are substantial, the Impact Study will produce an estimate for the modification costs (within ±25%) and a Detailed Study Agreement and its estimated cost. Interconnecting Customers who elect to execute an Interconnection Service Agreement following the completion of the Impact Study but prior to the commencement of the Detailed Study, pursuant to Section 3.4(g) of the Interconnection Tariff, shall be responsible for any System Modifications costs, ±25%, as identified by the Company in the Impact Study.

5) Impact Study, together with any additional studies contemplated in Paragraph 3, shall form the basis for the Interconnecting Customer's proposed use of the Company EPS and shall be furthermore utilized in obtaining necessary third-party approvals of any required facilities and requested distribution services. The Interconnecting Customer understands and acknowledges that any use of study results by the Interconnecting Customer or its agents,

whether in preliminary or final form, prior to NEPOOL 18.4 approval, should such approval be required, is completely at the Interconnecting Customer's risk.

6) The Impact Study fee of 35000.00 (except as noted below) is due in full prior to the execution

of the Impact Study. If the anticipated cost exceeds $25,000, the Interconnecting Customer is eligible for a payment plan, including a payment and construction schedule with milestones for both parties. At the request of the Interconnecting Customer, the Company will break the costs into phases in which the costs will be collected prior to Company expenditures for each phase of the study. The payment plan will be attached as an exhibit to the Impact Study Agreement.

7) The Company will, in writing, advise the Interconnecting Customer in advance of any cost increase for work to be performed up to a total amount of increase of 10% only. All costs that exceed the 10% increase cap will be borne solely by the Company. Any such changes to the Company's costs for the work shall be subject to the Interconnecting Customer's consent. The Interconnecting Customer shall, within thirty (30) days of the Company's notice of increase, authorize such increase and make payment in the amount up to the 10% increase cap, or the Company will suspend the work and the corresponding agreement will terminate.

8) Final Accounting. An Interconnecting Customer may request a final accounting report of any difference between (a) Interconnecting Customer's cost responsibility under this Agreement for the actual cost of the Impact Study, and (b) Interconnecting Customer's previous aggregate payments to the Company for the Impact Study within 120 Business days after completion of the construction and installation of the System Modifications described in an attached exhibit to the Interconnection Service Agreement. Upon receipt of such a request from an Interconnecting Customer, the Company shall have 120 Business days to provide the requested final accounting report to the Interconnecting Customer. To the extent that Interconnecting Customer's cost responsibility in this Agreement exceeds Interconnecting Customer's previous aggregate payments, the Company shall invoice Interconnecting Customer and Interconnecting Customer shall make payment to the Company within forty-five (45) Business Days. To the extent that Interconnecting Customer's previous aggregate payments exceed Interconnecting Customer's cost responsibility under this Agreement, the Company shall refund to Interconnecting Customer an amount equal to the difference within forty-five (45) Business Days of the provision of such final accounting report.

9) In the event this Agreement is terminated for any reason, the Company shall refund to the Interconnecting Customer the portion of the above fee or any subsequent payment to the Company by the Interconnecting Customer that the Company did not expend or commit in performing its obligations under this Agreement. Payments for work performed shall not be subject to refunding except in accordance with Paragraph 8 above.

10) Nothing in this Agreement shall be interpreted to give the Interconnecting Customer immediate rights to wheel over or interconnect with the Company's EPS.

11) Interconnecting Customer shall not voluntarily assign its rights or obligations, in whole or in part, under this Agreement without Company's written consent. Any assignment Interconnecting Customer purports to make without Company's written consent shall not be valid. Company shall not unreasonably withhold or delay its consent to Interconnecting Customer's assignment of this Agreement. Notwithstanding the above, Company's consent will not be required for any assignment made by Interconnecting Customer to an Affiliate or as collateral security in connection with a financing transaction. In all events, the Interconnecting Customer will not be relieved of its obligations under this Agreement unless,

and until the assignee assumes in writing all obligations of this Agreement and notifies the Company of such assumption.

12) Except as the Commonwealth is precluded from pledging credit by Section 1 of Article 62 of the Amendments to the Constitution of the Commonwealth of Massachusetts, and except as the Commonwealth's cities and towns are precluded by Section 7 of Article 2 of the Amendments to the Massachusetts Constitution from pledging their credit without prior legislative authority, Interconnecting Customer and Company shall each indemnify, defend and hold the other, its directors, officers, employees and agents (including, but not limited to, affiliates and contractors and their employees), harmless from and against all liabilities, damages, losses, penalties, claims, demands, suits and proceedings of any nature whatsoever for personal injury (including death) or property damages to unaffiliated third parties that arise out of, or are in any manner connected with, the performance of this Agreement by that party, except to the extent that such injury or damages to unaffiliated third parties may be attributable to the negligence or willful misconduct of the party seeking indemnification.

Notwithstanding the foregoing, the Interconnecting Customer hereby waives recourse against the Company and its Affiliates for, and releases the Company and its Affiliates from, any and all liabilities arising from or attributable to incomplete, inaccurate, or otherwise faulty information supplied by the Interconnecting Customer.

13) If either party materially breaches any of its covenants hereunder, the other party may terminate this Agreement by serving notice of same on the other party to this Agreement.

14) This agreement shall be construed and governed in accordance with the laws of the Commonwealth of Massachusetts.

15) All amendments to this Agreement shall be in written form executed by both Parties.

16) The terms and conditions of this Agreement shall be binding on the successors and assigns of either Party.

17) This Agreement will remain in effect for a period of up to two years from its effective date.

18) This Agreement may be terminated under the following conditions.

a) The Parties agree in writing to terminate the Agreement.

b) The Interconnecting Customer may terminate this agreement at any time by providing written notice to company

c) The Company may terminate this Agreement if the Interconnecting Customer either: (1) has not paid the fee or, (2) has not responded to requests for further information in accordance with provisions in the Interconnection Tariff, specifically Section 3.6.2.

ENTER CUSTOMER NAME	**National Grid**
Signature: Alan Clapp	Signature:
Name: ALAN CLAPP	Name:
Title: VP BUS. DEV.	Title:
Date: 8/22/18	Date:

(For Application Number 00185866)

Submit

Need assistance with this form?

Facility Operation & Maintenance Plan

nexamp

Spring Street Renewables, LLC
O&M Services Plan

October 26, 2018

Spring Street Renewables, LLC, a wholly-owned subsidiary of Nexamp, Inc., as the developer and construction manager of an approximately 6 MW (DC) solar PV array on property that will be owned by Lewis Street Realty, on Spring St. in Franklin MA, is pleased to provide this Operation and Maintenance (O&M) services plan.

Nexamp Asset Management Services, LLC (NAMS) is a full-service photovoltaic Operations and Maintenance company, servicing more than 110 MW as of October 2018. Spring Street Renewables, LLC intends to contract with NAMS in order to provide O&M services for the project for the first ten years of the system operation. At that time, Spring Street Renewables, LLC will revisit that contract and intends to renew the term at ten year intervals for the remaining life of the project.

Attached to this Services Plan is a typical scope of work for an O&M provider for a large-scale solar PV array. NAMS has used this scope of work as the basis for its services for infrastructure that it currently maintains. In the following template, "Contractor" represents NAMS and "Owner" represents the project owner, Spring Street Renewables, LLC.

The primary services under the scope of an O&M agreement include:

- Biannual array maintenance inspections, remote monitoring, unscheduled maintenance (fault detection), and scheduled equipment replacement.
- On-site services typically require a single pick-up truck and 2-4 licensed technicians.
- Technicians perform work with hand tools and battery-operated power tools and rarely require generators or any motorized or heavy equipment.
- The array is designed to facilitate major equipment replacement using truck mounted boom lift every 5-10 years.
- Spring Street Renewables, LLC will develop the site with using a pile driven or screw mounting system for the array.

Maintenance Activities include:

- Mowing operations are typically conducted 2 to 4 times per season, depending on the weather conditions and resultant growth. Normally, 2 to 4 personnel using ride-on and self-propelled mowers and weed whackers will perform the mowing operations.
- The entire Site is inspected for any erosion problems upon each site visit and maintenance activity, a minimum of two times per year. Any erosion to roads, embankments, drainage structures/basins, ground cover, etc. is repaired using

101 Summer Street
Boston, MA 02110
phone: 617.431.1440
web: www.nexamp.com

similar methods to the initial install (and as approved by the regulatory agencies), with like equipment and materials. Potentially, additional erosion control blankets, jute netting, etc. will be added to protect the maintenance improvement.

- Depending on the array location and surrounding vegetation, an arborist with boom truck will thin shading tree growth.
- In the event that weed control is required, NAMS uses only non-persistent solutions previously approved for use by DEP and many municipalities for use in regulated and protected areas. The frequency of this activity is typically annually or biannually, if at all. Work is typically performed by licensed applicators using trailer born and backpack spraying apparatus.
- Spring Street Renewables, LLC does not anticipate conducting module washing at this site. In the event that modules are washed, cleaning solution consists of 95% water and 5% non-toxic, non-persistent soap solution. Work is typically performed by 2-4 technicians using backpacks and scrubbing wands.
- Some snow removal may be required to allow site access during winter months, however no snow removal operations will be performed within the array areas.
- Inspection of the storm water management facilities will occur at each site inspection, no less than biannually, and maintenance provided to restore the facilities to their original condition and as approved by the regulatory agencies.

Scope of Work – O&M Services Contract

Nexamp Asset Management Services (the "Contractor") will provide O&M services for the proposed 6 MW (DC) solar photovoltaic system located on property that will be owned by Lewis Street Realty at Spring Street in Franklin, MA (the "Facility"). The services to be provided will include the operation, repair, monitoring and maintenance services listed below.

FACILITY OPERATIONS

The Facility will be operated in conformity to the operating specifications and requirements set forth in the O&M Manual, in compliance with prudent industry practices, in accordance with the terms and conditions of the interconnection agreement between the Owner and the local distribution utility, and in accordance with applicable law. As required to achieve these operational requirements, the O&M Contractor shall be present at the Facility site.

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PERFORMANCE MONITORING AND OPERATIONS REPORTING

During the Service Term, Contractor shall:

- At all times perform basic monitoring of the Facility to make sure Facility is fully functional and record and report all meter data consistent with all Solar Program requirements.
- Provide Owner with web access to basic monitoring data.
- Provide Owner with quarterly reporting of performance against predicted power and historical performance beginning three calendar months after the Commercial Operations Date (as defined as "Substantial Completion" in the EPC Agreement) is achieved, including, summaries of energy measured and reported by the Facility's revenue grade meters, a summary of planned maintenance, and a summary of all forced outages and emergency response measures and the steps that were taken to resolve such forced outages and emergency situations.
- Provide copies of all such information no later than thirty (30) calendar days of making or receiving information pertaining to maintenance and/or repair pertaining to the system and/or any portion thereof or the Interconnection.
- Maintain warranty records with all inverter, module, and mounting suppliers.
- Maintain service agreements with DAS suppliers.

SCHEDULED INSPECTION AND MAINTENANCE

- Contractor will perform required maintenance of the Facility in accordance with the written manufacturer requirements for operation and maintenance of the equipment that is part of the Facility (such written instructions are included in the O&M Manual).

- Contractor will provide continuous 24/7 active monitoring of Facility performance and provide a single point of contact for Facility maintenance and repair related issues.

- Contractor will implement the preventive maintenance schedule, if any, for each item of equipment that is part of the Facility, as set forth in the relevant portions of the O&M Manual.

- Contractor will maintain maintenance logs, records and reports documenting the provision of O&M Services hereunder in sufficient detail to allow Owner to verify that the Facility is performing in accordance with the Project Warranty and the performance requirements for the Facility. Contractor shall maintain current revisions of the drawings, specifications, lists, clarifications and other materials relating to the Facility.

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• Contractor will complete and submit to Owner in a timely manner maintenance log sheets to document Contractor's provision of Services as required hereby in sufficient detail to allow Owner to verify that the Facility is performing in accordance with the Project Warranty and the performance requirements for the Facility.
• Contractor will regularly maintain the Facility, in accordance with the O&M Manual, and provide semi-annual on-site inspections by completing the following:

- Visual inspection of all feeder terminations for corrosion.
- Visual check of all power terminations/connections associated with the system e.g. DC combiner boxes, DC and AC disconnects, surge arrestors, inverters and PV modules and re-torque as necessary.
- Test of ground continuity and correct any unsafe or abnormal issues.
- Check of all fuses in inverters, combiner boxes, and disconnects (AC&DC).
- Testing and recording of voltage and amperage of the arrays at the string level.
- Inspection of the combiner boxes, disconnects (AC&DC), and inverters with an infrared camera, with the purpose of detecting hotspots, bad connections, etc.
- Checking of the mechanical and structural integrity of the system.
- Cleaning or replacement of inverter air filters where applicable if necessary.
- Checking of inverter housing for dust/water ingress.
- Checking and replacement of any unserviceable system labeling as necessary.
- Visual inspection of weather stations and calibration verification against monitored data.
- Checking of modules for excessive dirt and debris. Cleaning is excluded.
- Providing written documentation to include summary report of findings including actions taken and recommendations for additional maintenance or repairs, etc.

FAULT DETECTION AND DISPATCH

• Contractor shall respond to all alarms, alerts and service requests pertaining to the system within 24 hours of such alarm, alert and/or service request, as personnel safety and weather conditions permit.

• Contractor shall monitor and respond to forced outages and performance trends. Contractor and Owner shall notify the other as soon as practically possible, but in no event later than twenty-four (24) hours following their discovery, of "Forced Outage", which is defined as: (a) any material malfunction in the operation of the Facility and/or (b) any interruption in the delivery of energy to the Facility's revenue grade meters. Contractor shall apply safe industry best practices to fully resolve any Forced Outage as quickly as possible. To the extent the correction of the Forced Outage requires either O&M Services or Warranty Services, Contractor shall initiate the O&M Services or Warranty Services needed to return the Facility to service within 24 hours of such notice,

and where applicable, as manufacturer service capabilities permit. Contractor shall provide Owner with an estimate of the time necessary to return the Facility to fully operational service. Contractor agrees to notify the Owner as soon as practicable when the Facility returns to service, but in no event later than twenty-four (24) hours following the Facility's return to service.

• Contractor and Owner agree to notify the other upon the discovery of an Emergency condition pertaining to the Facility. If Contractor is notified of an Emergency condition by Owner or otherwise learns of an Emergency condition, Contractor agrees to promptly dispatch appropriate personnel to address such Emergency as quickly as possible in accordance with industry best practices, and as personnel safety permits. Contractor maintains the right to disconnect the Facility and/or to otherwise isolate the Facility from the electric distribution system servicing Owner's and Owner's property as a result of any Emergency condition pertaining to the Facility as determined at the Contractor's discretion; provided, however, that the Contractor shall be responsible for any adverse consequences caused by such exercise of discretion if the exercise is negligent or represents a breach hereof.

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SPRING STREET RENEWABLES, LLC EMERGENCY RESPONSE AND COMMUNICATIONS PLAN

OCTOBER 2018

Overview

This Emergency Response and Communications Plan ("ERCP") outlines the general procedures followed for all emergency situations and incidents that could arise as a result of the operation, maintenance and decommissioning of the solar photovoltaic facility due to weather events, equipment failure, human error or other accident. Shortly after commercial operation, an affiliate of Spring Street Renewables, LLC will meet with the local emergency service personnel (fire, police, and EMS) to review and discuss the operation and decommissioning processes, including unique equipment, the overall process, as well as schedule and phasing. Any hazardous materials that may be present during each phase will be discussed. There are typically no hazardous materials present during operation. Ongoing communication between town officials and police, fire, and emergency services officials, will help assure adequate levels of safety and protection. A site specific health and safety plan (HASP) will also be developed and maintained on site. Based on relevant experience, Spring Street Renewables, LLC believes that the following types of hazards are most likely to have the potential to occur during maintenance and decommissioning activities.

- Personnel injury or medical emergency
  - Electrocution
  - Slips, trips and falls
  - Medical Emergency
- Auto and heavy equipment accidents
- Natural or electrical fire
- Hazardous material spills
  - Gasoline
  - Diesel fuel
  - Hydraulic oil
  - Lubricating oil and grease
  - Cleaning solvents

Spring Street Renewables, LLC is committed to protecting the community, personal property, wildlife and the environment in adherence to all applicable local, state and federal laws and regulations.

Emergency Contact Information

Nexamp personnel, including a specified Emergency Response Coordinator, will be available to arrive on site and may be utilized to assist during emergency situations and/or provide first aid

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as needed. For all emergency services including hospital, fire etc. call 9-1-1. During operation of the facility, a phone number where a Nexamp representative can be reached 24 hours a day will be established and shown on a sign as "IN CASE OF EMERGENCY, PLEASE CONTACT NEXAMP AT (617) 431-1440 x8" and will be provided to local emergency personnel along with the location of the nearest hospital.

Internal Reporting

The following procedures will be prescribed for internal reporting of emergencies.

1. Once notified by local emergency service personnel, the Emergency Response Coordinator will notify any on-site personnel, including any visitors, of the nature of the emergency either in person or via phone.
2. The Emergency Response Coordinator will specify the location for the first responders, if they are not already present onsite. A designated employee or contractor will meet the emergency response personnel at the access road of the emergency.
3. The Emergency Response Coordinator will notify local emergency personnel, if not already present, of the emergency using the contact information to be provided.
4. The Emergency Response Coordinator will identify any need for access control measures at the facility during the emergency and designate a competent person to implement.
5. Personnel will be trained that when any person identifies an emergency situation, or the potential for an emergency situation, and reports it to the Emergency Response Coordinator or his/her designee, the Emergency Response Coordinator will then activate the Plan.

External Reporting

The following procedures will be prescribed for external reporting of emergencies.

- If immediate emergency response assistance is required, the Emergency Response Coordinator or his designee will call 9-1-1.
- A member of management or the Emergency Response Coordinator or his/her designee are the only persons authorized to speak on Nexamp's behalf to outside agencies (police, fire department, medical services etc.) during an emergency situation.
- In the event of a spill of a hazardous material in excess of reportable limits, the spill must be reported to the Department of Environmental Protection or relevant federal authority.

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Emergency Response Procedures

Personnel Injury or Medical Emergency

- Provide First Aid to all injured employees or contractors regardless of severity.
- A First Aid kit will be maintained onsite. First Aid kits are to be inspected regularly and restocked as needed following usage.
- Call 9-1-1 if the injury is serious and needs immediate medical treatment.
- For local emergency response assistance, a designated employee or contractor will meet the emergency responders at the access road of the tower site and direct them to the location of the emergency/injured employee.
- The designated employee or contractor should have a hand-held orange safety flag to use to get the attention of the responding emergency services.
- Regular inspection of fire extinguishers, if required by the local fire department, at all facility locations where they are installed.

Auto and Heavy Equipment Accidents

- Personnel scheduled to work on site will be briefed prior to arrival on facility road conditions, speed limits and hazards
- Ground guides will be used in situations requiring cranes, excavators, lifts and other heavy equipment to operate in the vicinity of plant equipment, personnel and other vehicles.
- Personnel will be briefed not to approach working heavy equipment without first receiving acknowledgement and approval from the vehicle operator.
- Additional care will be exercised by all auto and equipment operators during periods of darkness, rain, snow and icy conditions.
- All collisions or near misses, regardless of severity, will be reported to the Emergency Response Coordinator or his/her representative.
- Accidents requiring medical or firefighting personnel will follow the instructions listed in those sections.

Fire

If a natural, vehicle or equipment related fire exists at the facility, personnel or contractors will follow the following procedures.

1. Provided it is safe to do so, employees can extinguish small fires using the onsite fire extinguisher.
2. For all other fires, alert others on site to immediately vacate the area and assemble at a specified location for accountability.

3. Shutdown the facility at the point of utility interconnection, provided it is safe to do so.
4. Restrict the area.
5. Request assistance from firefighting personnel, if needed, in controlling the fire.
6. If local emergency response personnel are required, have an employee go to the access road of incident site, to meet emergency personnel and direct them to the fire.
7. Employees will use a hand-held orange safety flag, safety vest or other brightly covered material to get the attention of the responding emergency service personnel.

Hazardous Material Spills

Cautionary labeling will be provided for any hazardous chemicals and the associated Material Safety Data Sheets (MSDS) or Globally Harmonized System (GHS) documentation will be provided accordingly.

1. The MSDS/GHS for all hazardous materials used at the facility will be provided to the local fire department and emergency service providers upon request.
2. Drip pans and associated control measures will be used for all refueling and hydraulic maintenance activities.
3. Small spills will be cleaned up immediately using absorbent materials such as hay, sand, socks or pads.
4. If the spill is of such magnitude that it cannot be contained, the Emergency Response Coordinator will contact the appropriate authority for assistance.
5. Personnel and contractors will be instructed to report all spills, regardless of severity, to the Emergency Response Coordinator.
6. Once a spill is identified, the Emergency Response Coordinator or his/her designee will maintain access control measures to safeguard personnel and environmental safety until the spill mitigation is complete.

Site Restoration/Remediation

If any accident or incident at the facility necessitates site restoration or remediation, the restoration/remediation will be conducted according to applicable federal, state and local requirements.

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Incident Reporting

After every accident or incident, the Emergency Response Coordinator or designee will conduct a post incident evaluation to determine the following.

1. Suitability of the organization's structure, operations, equipment, communication plans, adequacy of training, alarm systems, security and access control, spill containment and recovery procedures, monitoring and safety programs.
2. If any of the above are found to be inadequate, the Emergency Response Coordinator will make necessary changes.

Safety Training

On-site training for local emergency personnel may be given, at their request, by the Emergency Response Coordinator or their designees regarding the content, requirements, and appropriate actions to comply with the provisions of the Plan. The training will occur:

1. At the facility;
2. When changes are made to the plan;
3. At the request of local emergency personnel;
4. When Emergency Response Coordinator determines.

Recording of Responder Complaints

1. Any and all complaints from responders will be kept in both a log book and an electronic log.
2. The name, address, telephone number, date and time of all responders issuing a complaint will be included with the responder's complaint.
3. Assurance will be provided to all responders that complaint has been mitigated and will not reoccur.
4. In addition to the above, complaints requiring significant plan or operational adjustments will be answered in writing within seven (7) days of the complaint.

Decommissioning Memorandum

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To: Respective Planning Board in Franklin, MA

Date: November, 2018

Decommissioning Surety Memorandum

Introduction

Nexamp has prepared this Decommissioning Plan (Plan) for the Spring Street Renewables, LLC Photovoltaic Facility (Facility) off Spring Street, Franklin, Massachusetts. This Plan was prepared to fulfill the requirements of the local bylaws and zoning ordinances and assumes that the Facility will be constructed in accordance with the potential Order of Conditions from each respective Planning Board and Conservation Commission.

Facility Description

The proposed solar system Facility will consist of a new **6.2 Megawatt MW (DC)** capacity solar power-generating operation secured within a chain-link fence surrounding the solar panels and equipment and accessed via a locked CLF gate from Spring Street in Franklin, MA. The Facility will include the following site features:

- An approximately 25-acre array of photovoltaic (PV) modules (panels) and mounting system;
- Screw driven piles supporting the photovoltaic modules;
- Up to two (2) transformers (filled with biodegradable vegetable oil);
- Underground conduit;
- A seven (7)-foot chain-link security fence;
- Underground conduit and wires;
- Up to six (6) aboveground wooden utility poles;
- Overhead wires;
- A gravel access road; and
- A metal security gate at the access road entrance off Spring Street.

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Decommissioning Plan

The Facility will be decommissioned by completing the following major steps: Dismantlement and Demolition, Disposal or Recycle, and Site Stabilization as further described below.

Dismantlement, Demolition, and Disposal or Recycle

A significant amount of the components of the photovoltaic system at the Facility will include recyclable or re-saleable components, including copper, aluminum, galvanized steel, and modules. Due to their re-sale monetary value, these components will be dismantled and disassembled rather than being demolished and disposed of.

Following coordination with National Grid regarding timing and required procedures for disconnecting the Facility from the private utility, all electrical connections to the system will be disconnected and all connections will be tested locally to confirm that no electric current is running through them before proceeding. All electrical connections to the panels will be cut at the panel and then removed from their framework by cutting or dismantling the connections to the supports. Each panel will be individually lifted from its support (likely using a small crane and synthetic rigging straps), wrapped in sheet plastic and taped before being removed. They will then be stacked and cushioned on pallets, plastic wrapped, and transferred to a flat-bed truck for transfer to the purchaser or recycler. The exterior glass of the solar panels is commercial-grade and tempered, designed to significantly reduce a complete fracture. However, in the event of a total fracture, the interior materials are silicon-based and are not considered to be hazardous materials. Disposal of these materials at a landfill will be permissible.

The PV mounting system framework will be dismantled and recycled. The metal screw piles will be removed from their approximated depth of eight feet and recycled for salvage value.

Finally, all associated structures will be demolished and removed from the site for recycling or disposal as required in the bylaws for Franklin. This will include the site fence and gates, which will likely be reclaimed or recycled. Grade slabs will be broken and removed to a depth of one foot below grade, and clean concrete will be crushed and disposed of off-site or recycled (reused either on- or off-site).

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Sanitary facilities will be provided on-site for the workers conducting the decommissioning of the Facility.

Aboveground utility poles owned by Spring Street Renewables, LLC will be completely removed and disposed of off-site in accordance with utility best practices. Overhead wires will be removed from the area of the solar modules and terminated at the utility-owned (National Grid) utility poles located on Spring Street. The access road will remain in place and National Grid will be responsible for dismantling those overhead wires and poles under its ownership. Coordination with National Grid personnel will be conducted to facilitate National Grid's removal of their aboveground poles and overhead wires located on the site.

A final site walkthrough will be conducted to remove debris and/or trash generated within the site during the decommissioning process and will include removal and proper disposal of any debris that may have been wind-blown to areas outside the immediate footprint of the facility being removed.

Site Stabilization

The areas of the Facility that are disturbed (during decommissioning) will be stabilized with the ground treatment approved by the Planning Board during the Special Permit Review process, including application of a drought-tolerant grass seed mix to surfaces disturbed during the decommissioning process. The gravel access road from Spring Street, including the portion within the perimeter fence surrounding the photovoltaic modules, will remain intact and shall be not removed.

Permitting Requirements

Given the size and location of the Facility, several approvals are required prior to initiation of ground-disturbing activity. Table 1 provides a summary of the expected approvals if the decommissioning were to take place in November 2018. Noting, however, that because the decommissioning is expected to occur at a later date, the permitting requirements listed in the table below will be reviewed and updated based on current local, state, and federal regulations at the time.

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Schedule and Cost

The decommissioning process is estimated to take approximately six to eight (6-8) weeks (but no longer than six (6) months) and is intended to occur outside of the winter season.

Nexamp had solicited a specific construction estimate for decommissioning of this project (attached) along with assembling five separate bids regarding the salvage value of the raw materials intended for recycling.

Table 1. Current Permitting Requirements for Decommissioning

Permit	Agency	Threshold/Trigger
National Pollutant Discharge Elimination System (NPDES) General Permit for Discharges from Construction Activity	U.S. Environmental Protection Agency	Ground disturbance of greater than 1 acre with discharge to wetlands or water bodies. Requires preparation of a Stormwater Pollution Prevention Plan, including erosion and sedimentation controls.
Special Permit Approval	Town of Franklin Planning Board	Anticipated decommissioning requirements listed in the Special Permit Approval conditions of approval.
Building Permit	Town of Franklin Building Departments	A building permit is required to construct the facility. A building permit must also be obtained for any construction, alteration, repair, demolition, or change to the use or occupancy of a building.

Permitting Requirement Assumptions:

1. The access road will remain in place throughout the Facility.
2. All ground disturbance, including temporary laydown areas if required within areas subject to the Massachusetts Wetlands Protection Act will obtain the appropriate approval from the Franklin Conservation Commission (Assuming a negative determination from a RDA)

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Surety Proposal/ Decommissioning Cost Estimate

Consistent with the approach it has taken in surrounding communities, and pursuant to the Town of Franklin Zoning Ordinance , Nexamp, Inc., the parent company of Spring Street Renewables, LLC, proposes to provide a decommissioning surety bond, to be posted prior to the beginning of operations (COD) and the final Franklin Certificate of Compliance, in the amount of **$78,000.00**, for decommissioning in the unlikely event that Nexamp is unable to meet its contractual obligations for solar project removal and restoration.

In developing the decommissioning surety bond, Nexamp utilized a recent decommissioning cost estimates from J & J Construction, one of the region's largest site development contractors, specifically for this site. Nexamp also utilized recent 2018 salvage value estimates from five recycling facilities in New England based on the assumption of recycling the solar modules, racking and associated project components as raw materials. In addition to the decommissioning cost, Nexamp included a 5% contingency and allowance for associated legal costs.

Below is a summary of the analysis:

Project Size (Megawatts DC)	**6.2 MW (DC)**
Decommissioning Cost, No Salvage Value	
Decommissioning Estimate 6.2MW ($206,800)	$33,355 / MW
5% Contingency	$1,668 /MW
3% Legal Services Estimate	$1,001 /MW
Total Decommissioning Cost, No Salvage Value	**$36,024 /MW**
Salvage Value	
Market Based Salvage Estimate/ MW (Average of 5 Bids-2018)	$23,476/MW
Total Avg. Salvage Value:	**$23,476 /MW**
Decomm. Cost Estimate, Net Salvage Value	
Decommissioning Estimate	$36,024 / MW
Minus Salvage Value	($23,476)/ MW
Decommissioning Cost, Net Salvage ($)/MW:	**$12,548 /MW (DC)**
Proposed Total Decommissioning Cost for the 6.2 MW Solar Project :	**$78,000.00**

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The following attachments are included:

- J & J Construction Corporation Decommissioning Cost Estimate for the 6.2 MW (DC) Nexamp project at Spring St., Franklin
- Salvage Value Summary, (letters provided upon rerquest)

Sincerely,

Alan L. Clapp

Alan L Clapp, P.E.; Spring Street Renewables, LLC, c/o Nexamp, Inc.;

VP Business Development

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Boston, MA 02110

phone: 617.431.1440
web: www.nexamp.com

J&J CONTRACTORS, INC.

November 12, 2018

Alan L. Clapp, P.E.
Spring Street Renewables, LLC

c/o Nexamp, Inc
101 Summer Street
Boston, MA 02110

Re: Spring Street, Franklin: Solar Decommissioning Cost Estimate

Dear Mr. Clapp,

J&J Contractors is pleased to provide you with the following decommissioning cost estimate for the 6.2 MW DC project in Franklin.

- Remove all solar infrastructures and return the site to a meadow condition
- Removal and disposal of non-recycled materials
- Removal and delivery to a recycling facility of the remaining materials (expecting most of the materials can be recycled)
- Dismantle panels, racking system, screw foundations, transformer/inverters, remove all wiring, R&D Nexamp utility poles (3)
- Slight regrading (smoothing of ruts) and reseeding of the area
  - Removal of concrete pads.
  - Labor and equipment cost for infrastructure $29,000.00/mw. For a total cost of $179,800.
  - Labor and material cost for slight regrading and seeding $ 21,000.00.
  - Labor and material cost for concrete removal $6,000.00

Total cost for above work $ 206,800.00

If you have any question, please feel free to call me.

Sincerely,

Kamlesh Patel
CEO
J&J Contractors, Inc.
KamP@JJContractor.com

10/8/18

Metal Green Recycling Industries

Office: 651-580-7570 Fax: 877-249-6117

All price is delivered to kearny NJ

Shipping term **Deliver**

Quantity must be specified before a PO is issued

**Price are subject to change due to market conditions.

Circle the item and quantity, simply email/fax back

Copper $2.76 **Date:** 10/8/2018

Copper product

Bare Bright Wire Only	CMX -14
#1 copper	$2.5200
#2 copper	$2.2800
Tin plated copper (wire only)	$2.3800
Lead Plated Copper	$2.2800
Sheet copper (0% attachement)	$2.120
Lead sheet copper / Irony sheet copper	1.90 /Call
Copper turning clean & dry	$1.92

Insulated wire (base on Copper %)

#1 MCM 85%	$1.96
#2 MCM 80%	$1.21
#1 single wire	$1.79
#1 Single & House	$1.50
#1 House wire	$1.40
#2 ICW (min 50%)	$0.84
#2 ICW 35% low grade	$0.46
Auto wire (Harness) - no attachment	$0.90
Computer wire and plugs	$0.22
Shredded wire	call
Christmas lights	$0.23
Steel bx (no attachments)	$0.28
Steel Bx with attachment	$0.22
Insulated alum wire 65%	0.34-0.40
Lead copper wire / URD	call (55-110)
Bare / Black / Irony CATV	Not Buying
Cu coax open / close / Alum	0.98 / 0.30 / Call
TV coaxial wire	$0.00

Stainless steel product

Clean 304 SS solid only - baled	$0.4600
SS 304 Unprepared	$0.25
316 SS solid only	$0.67
304 Stainless steel turning	$0.340

Misc Product

Electric motor small size / Mixed Motor	0.20/0.16
Low Grade motor/w power tools	$0.100
Huge motor / Excessive steel	0.09-0.13
Seal units / Ballast / electronic Ballast	0.16 / 0.12 / 0.04
Alternator / Al. Starter / Steel Starter	.34 / .24 / .19
Clean Die cast / Irony 60% min	0.66 / 0.26
Zinc anodes (w slightly iron)	$0.52
AC compressor	$0.21
Whole Air Conditioner	$0.12
Magnesium clean	$0.18
Copper transformer Palm size	$0.29
Copper transformer Mini Size	call
Cu/al transformer Palm size	$0.10
Al transformer Large / Small Palm Size	$0.04 / not buying
Computer Complete	$0.23
Computer Incomplete	$0.14
ACR ends / alum cutoffs	0.55 /No Quotes
Mix electronic	No Quotes

Lead product

Soft Lead clean	$0.70
Boat keel w steel attachment	$0.60
Wheel weights (pb)	$0.24
Clean Range lead indoor (Depend on quality)	$0.58
Range lead outdoor (Depend on quality)	call
Auto Battery / Steel case	0.34 / 0.30
Lead shot filtered	$0.60

Brass product

Clean Red brass (0% attachment)	$1.9850
Water meter / Irony water meter	1.95 /0.75
Red pipe (Base on Sort)	$2.09
Mixed Brass pipe	$1.900
Yellow brass ****no shells*****	$1.7808
Clean shells (no steel/alum/tin/chrom plated, 100% Clean)	$1.73
Mixed Shells(base on sort)	1.60 x %
Yellow brass turning clean (less Fe& Moisture, no Mn Trg)	1.58 x %
Mixed brass turning	$1.52
Auto radiator / Irony auto Rads only	1.57 / 0.80
Irony Truck Rads	$0.45
Clean Heator core(No FE)	$1.20
Brass valves	call
Irony brass 50%	not buying
Faucet Brass	$0.70 - $0.80

Radiator product

Alum copper rads / Irony	1.14 / 1.01
Aluminum radiator / Dirty	0.43 / 0.20

Aluminum product

356 wheel / chrom wheel -packaged/ skid	0.73/ 0.55
10/10 Extrusion (100%) Baled	$0.750
Extrusion with Slightly Fe	$0.680
Litho clean (light ink)	$0.70
Bare MLC (100% Clean, boxed or baled)	$0.610
Painted MLC (100% Clean, boxed or baled)	$0.59
Painted siding (100% Clean, baled)	$0.550
Siding with Slightly Fe	$0.540
UBC (100% Clean Baled only)	$0.45
Cast aluminum 2% max (boxed)	$0.44
Clean Thermo Break ** No Glass **	$0.43
Sheet aluminum 2% max	$0.44
Irony aluminum min. 50%	0.08-0.12
Sheet alum Off Spec / low grade taint tabor	$0.23
Transmission / Engine	$0.11
2000/7000 MLC	$0.35

ice is delivered to kearny NJ

#1 Prepared Steel $10.00 Per Hundred LB $2.24

#1 UnPrepared Steel $3.50 " " "

ANESTIS METAL CORP.

48 - 50 MEDFORD STREET
LAWRENCE, MA 01841

TEL: 978-681-6000
FAX: 978-681-6006

P.O. No.: _____

Date: 4/17/18

To: George Hamman

#1 Prepared steel (Quarter inch Thick Under 5 FT in Length)	
Delivered - $240/Gross Ton	
Picked up - $210/Gross Ton	
#1 Unprepared Steel (Quarter inch Thick OVER 5 FT in Length)	
Delivered - $210/Gross Ton	
Picked up - $180/Gross Ton	
LIGHT IRON (Less Then Quarter inch Thick)	
Delivered - $170 GT	
Picked up - $100 GT	
Insulated copper wire	Range - $.40 - $2.20
Insulated Aluminum	Range - $.20 - $.40

SALITSKY ALLOYS, inc. processors of insulated wire by granulation
metal recyclers
35 INDUSTRIAL DRIVE, HOLDEN, MASSACHUSETTS 01520-1848 • TEL: (508) 829-7400
FAX: (508) 829-7774

Ms. Ashai,

November 14, 2018

Thank you for allowing us to submit our bid for your scrap metal. Here is our proposal for the pricing range and handling of your scrap materials that we think you will find very attractive.

1. #1 Prepared Steel - $160-195/GT
2. Bare Aluminum Wire - $0.40-0.50/lb.
3. Bare Bright Copper Wire -$0.80-1.20/lb.

All of these prices are based on the date of proposal and what we believe the actual scrap materials to be. As you stated, this project will be in the future and the markets change every day. Until we see the materials in-person and have agreed upon delivery dates, these ranges are subject to change.

This proposal is for the Aluminum and Copper being dropped at our facility in Holden, MA, and Steel taken to one of our associate facilities in the Central Massachusetts region.

There are no other charges of any type. Payment terms are a standard Net 30 Days.

We are also full service scrap metal dealers. Therefore, we would be able to take and recycle any other metal scrap that you have and can provide you with container service if you would like.

We hope that you find this proposal very appealing. We are very excited at the prospect of working together with you.

If you have any other questions, please feel free to reach out and we will be happy to answer them.

We look forward to hearing from you.

Paul Heiken
Salitsky Alloys, Inc.

Salvage Values for Components of a 2.6 MW DC Solar Project

Components of Typical 2.6MW DC Solar Site:	TOTAL WEIGHT	imary Consituent Me	Anestis Metal Corp ($/lb)	tis Metal Corp Valu	Salitsky Alloys Inc ($/lb)	Salitsky's Valuation	een Recycling Industr	etal Green's Valuati	Mid City Scrap ($/lb)	Mid City's Valuation	Kane Scrap	Kane Scrap ($/lb)
Steel Components			SCRAP RATE / lb		SCRAP RATE / lb		SCRAP RATE / lb		SCRAP RATE / lb		SCRAP RATE / lb	
CFS Cee Section - 363.38"	227,184	Prepared Steel	$0.09	$21,298.45	$0.08	$18,002.26	$0.10	$22,718.35	$0.10	$21,805.56	$0.09	$21,298.45
External Lateral Brace Tube - 2.360"x0.095"X22.000"	6,270	Prepared Steel	$0.09	$587.82	$0.08	$496.85	$0.10	$627.01	$0.10	$601.82	$0.09	$587.82
Internal Lateral Brace Tube -80	11,438	Prepared Steel	$0.09	$1,072.34	$0.08	$906.38	$0.10	$1,143.82	$0.10	$1,097.87	$0.09	$1,072.34
Internal Lateral Brace Tube -81	11,539	Prepared Steel	$0.09	$1,081.79	$0.08	$914.37	$0.10	$1,153.91	$0.10	$1,107.55	$0.09	$1,081.79
Internal Lateral Brace Tube - 82	21,762	Prepared Steel	$0.09	$2,040.16	$0.08	$1,724.42	$0.10	$2,176.17	$0.10	$2,088.73	$0.09	$2,040.16
Complete HDG South Leg Assembly - 36.000"	9,801	Prepared Steel	$0.09	$918.83	$0.08	$776.63	$0.10	$980.09	$0.10	$940.71	$0.09	$918.83
Complete HDG North Leg Assembly - 99.000"	24,219	Prepared Steel	$0.09	$2,270.53	$0.08	$1,919.14	$0.10	$2,421.90	$0.10	$2,324.59	$0.09	$2,270.53
Inverter Posts - 96.000"	965	Prepared Steel	$0.09	$90.48	$0.08	$76.48	$0.10	$96.51	$0.10	$92.63	$0.09	$90.48
Rafter Beam - 134.760"	27,150	Prepared Steel	$0.09	$2,545.29	$0.08	$2,151.38	$0.10	$2,714.98	$0.10	$2,605.89	$0.09	$2,545.29
Galvanized Z-Furlin- 4ZS2 x 16 GA x 201.500"	46,276	Prepared Steel	$0.09	$4,338.34	$0.08	$3,666.93	$0.10	$4,627.56	$0.10	$4,441.63	$0.09	$4,338.34
Rafter Beam - 134.760"	26,053	Prepared Steel	$0.09	$2,442.45	$0.08	$2,064.45	$0.10	$2,605.28	$0.10	$2,500.60	$0.09	$2,442.45
Foundation K5F G 76x2100-3xm16	51,200	Prepared Steel	$0.09	$4,800.00	$0.08	$4,057.14	$0.10	$5,120.00	$0.10	$4,914.29	$0.09	$4,800.00
Cross Brace Assembly - 219"	1,643	Prepared Steel	$0.09	$154.05	$0.08	$130.21	$0.10	$164.32	$0.10	$157.72	$0.09	$154.05
Cross Brace Assembly - 203"	72	Prepared Steel	$0.09	$6.75	$0.08	$5.71	$0.10	$7.20	$0.10	$6.91	$0.09	$6.75
M8 - 1.25 Hex Bolt x 20mm w/ M8 External Tooth Lock Washer	7,702	Prepared Steel	$0.09	$722.10	$0.08	$610.34	$0.10	$770.24	$0.10	$739.29	$0.09	$722.10
1/4 Flatwasher 18.8 ss	57	Prepared Steel	$0.09	$5.33	$0.08	$4.51	$0.10	$5.69	$0.10	$5.46	$0.09	$5.33
1/4 Mid Split Lockwasher 18.8	51	Prepared Steel	$0.09	$4.78	$0.08	$4.04	$0.10	$5.10	$0.10	$4.90	$0.09	$4.78
M8 - 1.25 Hex Nut	4,263	Prepared Steel	$0.09	$399.68	$0.08	$337.83	$0.10	$426.33	$0.10	$409.20	$0.09	$399.68
1/4 Ext. Tooth Lock Washer	23	Prepared Steel	$0.09	$2.17	$0.08	$1.83	$0.10	$2.32	$0.10	$2.22	$0.09	$2.17
M6 External - Tooth LockWasher	62	Prepared Steel	$0.09	$5.79	$0.08	$4.90	$0.10	$6.18	$0.10	$5.93	$0.09	$5.79
M16-2.0 x 40 Socket Set Screw Cone Pt HDG	445	Prepared Steel	$0.09	$41.74	$0.08	$35.28	$0.10	$44.53	$0.10	$42.74	$0.09	$41.74
M16-2.0 Hex Jam Nut Gr. 2 HDG	198	Prepared Steel	$0.09	$18.57	$0.08	$15.70	$0.10	$19.81	$0.10	$19.02	$0.09	$18.57
3/8-16 x 3" Hex Bolt	148	Prepared Steel	$0.09	$13.84	$0.08	$11.70	$0.10	$14.76	$0.10	$14.17	$0.09	$13.84
3/8-16 x 1-1/2 Brace Clamp Carriage Bolt	278	Prepared Steel	$0.09	$26.08	$0.08	$22.04	$0.10	$27.82	$0.10	$26.70	$0.09	$26.08
3/8-16 Serrated Flange Nut	101	Prepared Steel	$0.09	$9.47	$0.08	$8.01	$0.10	$10.11	$0.10	$9.70	$0.09	$9.47
1/2 -13 x 1-1/2 Serrated Flange Hex Bolt	916	Prepared Steel	$0.09	$85.86	$0.08	$72.57	$0.10	$91.58	$0.10	$87.90	$0.09	$85.86
1/2 -13 x 3-1/2 Serrated Flange Hex Bolt	387	Prepared Steel	$0.09	$36.27	$0.08	$30.65	$0.10	$38.69	$0.10	$37.13	$0.09	$36.27
1/2 -13 Serrated Flange Nut	208	Prepared Steel	$0.09	$19.54	$0.08	$16.52	$0.10	$20.84	$0.10	$20.01	$0.09	$19.54
Interlocking Brace Clamp - HDG	5,092	Prepared Steel	$0.09	$477.40	$0.08	$403.52	$0.10	$509.23	$0.10	$488.77	$0.09	$477.40
L 5x5x1/2 Finished L-Bracket	10,137	Prepared Steel	$0.09	$950.36	$0.08	$803.28	$0.10	$1,013.72	$0.10	$972.99	$0.09	$950.36
	495,640			$46,466.28		$39,275.97		$48,550.31		$46,599.63		$45,515.92
Wire, Insulated			SCRAP RATE / lb		SCRAP RATE / lb	TOTAL	SCRAP RATE / lb		SCRAP RATE / lb		SCRAP RATE / lb	
#10 PV RATED WIRE Cu per circuit (1000VDC)	6,035	Copper	$1.30	$7,845.50	$1.00	$6,035.00	$0.84	$5,069.40	$2.35	$14,182.25	$2.40	$14,484.00
250MCM AL RHW-2 (1000VDC)	12877	Aluminium	$0.30	$3,863.10	$0.45	$5,794.65	$0.37	$4,764.49	$0.35	$4,506.95	$0.60	$7,726.20
#1 AL EGC RHW-2 (1000VDC)	924	Aluminium	$0.30	$277.20	$0.45	$415.80	$0.37	$341.88	$0.35	$323.40	$0.60	$554.40
400 KCMIL AL.	488	Aluminium	$0.30	$146.40	$0.45	$219.60	$0.37	$180.56	$0.35	$170.80	$0.60	$292.80
350 KCMIL AL.	435	Aluminium	$0.30	$130.50	$0.45	$195.75	$0.37	$160.95	$0.35	$152.25	$0.60	$261.00
1/0 AWG AL. 15kV	332	Aluminium	$0.30	$99.60	$0.45	$149.40	$0.37	$122.84	$0.35	$116.20	$0.60	$199.20
Total Value of Aluminum and Copper				$12,362.30		$12,810.20		$10,640.12		$19,851.85		$23,517.60
Total Value per 2.6MW DC				$58,828.58		$52,085.37		$59,190.43		$66,051.48		$69,033.52
Total Salvage Value per MW DC				$22,626.38		$20,032.80		$22,765.55		$25,404.41		$26,551.35

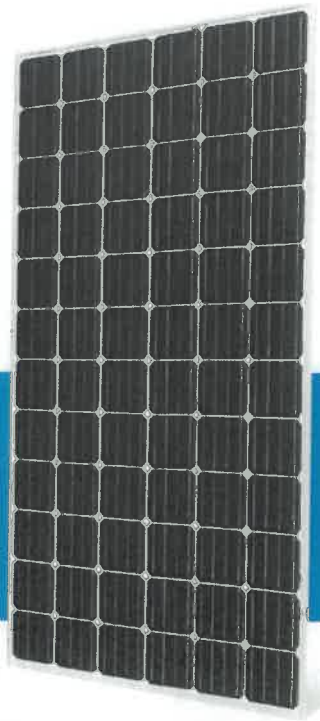
Equipment Literature & Specifications

HYUNDAI SOLAR MODULE

KI SERIES

Mono-Crystalline Type

HiS-S330KI HiS-S335KI HiS-S340KI HiS-S345KI
HiS-S350KI HiS-S355KI HiS-S360KI



72
Cells

For Utility-Scale Applications

UL 1,500V
Saves BOS Costs

More Power Generation In Low Light

HYUNDAI CELL
Hyundai Cell

PERL Technology

PERL technology provides ultra-high efficiency with better performance in low irradiation. Maximizes installation capacity in limited space.

Anti-LID / PID

Both LID(Light Induced Degradation) and PID(Potential Induced Degradation) are strictly eliminated to ensure higher actual yield during lifetime.

Mechanical Strength

Tempered glass and reinforced frame design withstand rigorous weather conditions such as heavy snow and strong wind.

Reliable Warranty

Global brand with powerful financial strength provide reliable 30-year warranty.

Corrosion Resistant

Various tests under harsh environmental conditions such as ammonia and salt-mist passed.

UL / VDE Test Labs

Hyundai's R&D center is an accredited test laboratory of both UL and VDE.

Hyundai's Warranty Provisions

12 YEARS
- 12-Year Product Warranty
  - On materials and workmanship

30 YEARS
- 30-Year Performance Warranty
  - Initial year: 97.6%
  - Linear warranty after second year: with 0.6%p annual degradation, 80.2% is guaranteed up to 30 years

About Hyundai Solar

Established in 1972, Hyundai Heavy Industries (HHI) is one of the most trusted names in the heavy industries sector with 48,000 employees and more than 40 Billion USD in annual sales (2015). As a global leader and innovator, Hyundai Heavy Industries is committed to building a future growth engine by developing and investing heavily in the field of renewable energy.

Started as a core business division of HHI, Hyundai Solar (Hyundai Heavy Industries Green Energy) now stands as an independent company and an affiliate of HHI as from December 2016. We have strong pride in providing high-quality solar PV products to more than 3,000 customers worldwide.

Certification

HYUNDAI GREEN ENERGY

Electrical Characteristics

		Mono-Crystalline Type(HiS-S___KI)						
		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Nominal Output [illegible]	W	330	335	340	345	350	355	360
Open Circuit Voltage [illegible]	V	46.3	46.5	46.7	46.9	47.1	47.3	47.4
Short Circuit Current [illegible]	A	9.3	9.4	9.5	9.6	9.6	9.7	9.8
Voltage at Pmax [illegible]	V	38.0	38.2	38.4	38.6	38.7	38.9	39.1
Current at Pmax [illegible]	A	8.7	8.8	8.9	9.0	9.0	9.1	9.2
Module Efficiency	%	16.9	17.1	17.4	17.6	17.9	18.1	18.4
Cell Type		6", mono-crystalline silicon						
Maximum System Voltage	V	1,500						
Temperature Coefficient of Pmax	[illegible]	-0.42						
Temperature Coefficient of Voc	[illegible]	-0.30						
Temperature Coefficient of Isc	[illegible]	0.047						

*All data at STC (Standard Test Conditions). Above data may be changed without prior notice.

Mechanical Characteristics

Dimensions	998 mm (39.29")(W) × 1,960 mm (77.17")(L) × 40 mm (1.57")(H)
Weight	Approx. 22.9 kg (50.5 lbs)
Solar Cells	72 cells in series (6 × 12 matrix) (Hyundai cell, Made in Korea)
Output Cables	4 mm² (12AWG) cables with polarized weatherproof connectors, IEC certified (UL listed and UL 4703 certified), Length 1.2 m (47.2")
Junction Box	IP67, weatherproof, IEC certified (UL listed)
Bypass Diodes	3 bypass diodes to prevent power decrease by partial shade
Construction	Front : Anti-reflection coated glass, 3.2 mm (0.126") Encapsulant : EVA I Back Sheet : Weatherproof film
Frame	Clear anodized aluminum alloy type 6063

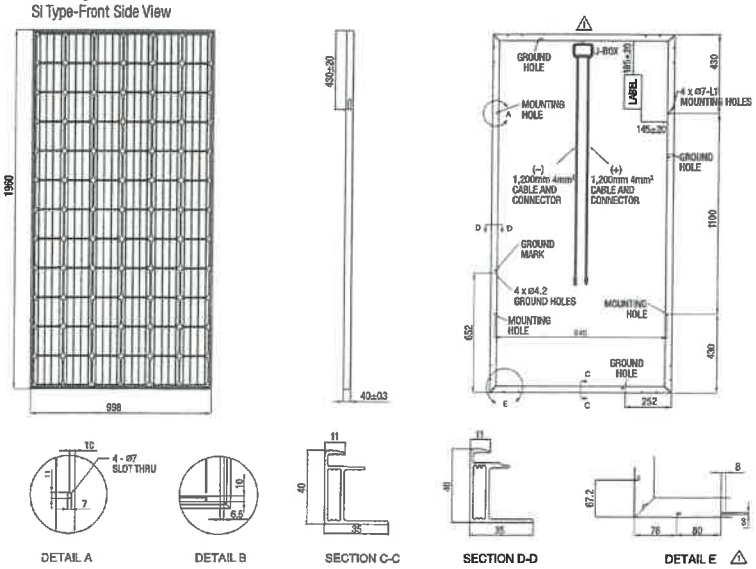
Installation Safety Guide

- Only qualified personnel should install or perform maintenance.
- Be aware of dangerous high DC voltage.
- Do not damage or scratch the rear surface of the module.
- Do not handle or install modules when they are wet.

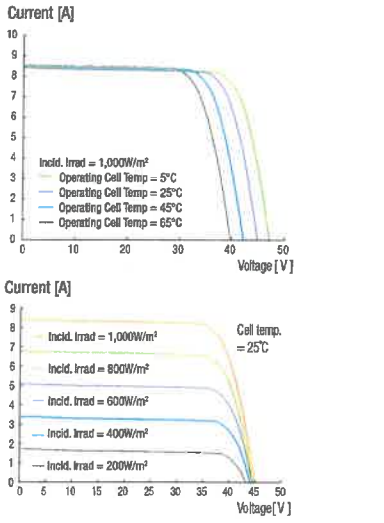
Nominal Operating Cell Temperature	46°C ± 2
Operating Temperature	-40 – 85°C
Maximum System Voltage	DC 1,500 V (UL)
Maximum Reverse Current	15A (Up to 350W) 20A (Above 355W)

Module Diagram (unit : mm)

Mono-Crystalline
SI Type-Front Side View



I-V Curves



HYUNDAI GREEN ENERGY

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NEC
NEC ENERGY SOLUTIONS

DSS®
Distributed Storage Solution

NEC Energy Solution's Distributed Storage Solution (DSS®) enables advanced energy management and resiliency services for commercial & industrial customers and the utilities that serve them.

The relationship between utilities and commercial & industrial customers is being transformed as enterprises produce as well as consume electricity and actively manage the amount and timing of their energy use. The fully integrated DSS® platform enables next-generation energy storage-based services on both sides of the electricity meter: reducing energy costs and increasing resiliency for commercial & industrial enterprises, while improving efficiency, predictability, and distributed resource dispatchability for utilities.

The DSS® platform integrates energy storage, power conversion and system controls into a range of flexible outdoor-rated configurations that are simpler, smarter, and safer than other point products. DSS® systems may operate autonomously, within an enterprise energy management system, under utility or local SCADA control, as part of an aggregator's virtual power plant, or any combination of these.

EXAMPLE APPLICATIONS

The DSS® platform allows integrators and service providers to deliver advanced energy management services to enterprises and/or utilities.

For commercial & industrial enterprises, DSS® systems support emerging 'behind-the-meter' services including:

- Demand charge management
- Demand response
- Power quality and resiliency
- Distributed/renewable generation integration
- Time-of-use management

For utilities, DSS® systems deliver distribution grid 'front-of-the-meter' services including:

- Dispatchable load and demand management
- T&D congestion relief and upgrade deferral
- Voltage support
- Renewable capacity firming/ramp management
- Distributed ancillary services

KEY FEATURES

2 BAY UNIT

ENERGY (kWh)	POWER (kW)
85	100
170	100
	280

4 BAY UNIT

ENERGY (kWh)	POWER (kW)
255	100
	280
340	100
	280
	710

6 BAY UNIT

ENERGY (kWh)	POWER (kW)
425	100
	280
	710
510	100
	280
	710

NOTES

- The 710kW option requires separate MV transformer (not included).
- In addition to PCS options shown above, DSS® systems are offered without a PCS enabling custom configurations. The AC interconnect is replaced by a 720V (nominal) DC bus.

Proven Battery Technology
The DSS® platform uses proven industry-leading lithium-ion battery storage technologies, leveraging years of operational experience of NEC Energy Solution's leading GSS® product lines. In the DSS® system, NEC Energy Solutions offers the optimal technology for typical demand charge management and similar peak shaving applications.

Flexible Power Conversion
Pre-integrated, 4 quadrant, bi-directional inverters are available within the DSS® systems. Choose from remote-mounted 100kW, 280kW, or 710W component PCS options, all provided as fully integrated, ready-to-install systems.

Powerful AEROS® Controls
NEC Energy Solution's AEROS® Controls, with C&I optimized Demand Charge Reduction, Peak Shaving, and Load Limiting applications, is provided with every DSS system. The complete AEROS® application suite, including functions for grid ancillary services, volt/VAR control, ramp rate management, and other applications is also available.

Pre-Engineered Environmental Control
Mechanical system optimization and serviceability is key to maximizing overall system life and availability. DSS pre-engineered systems leverage NEC Energy's years of experience developing systems used in harsh environments around the world.

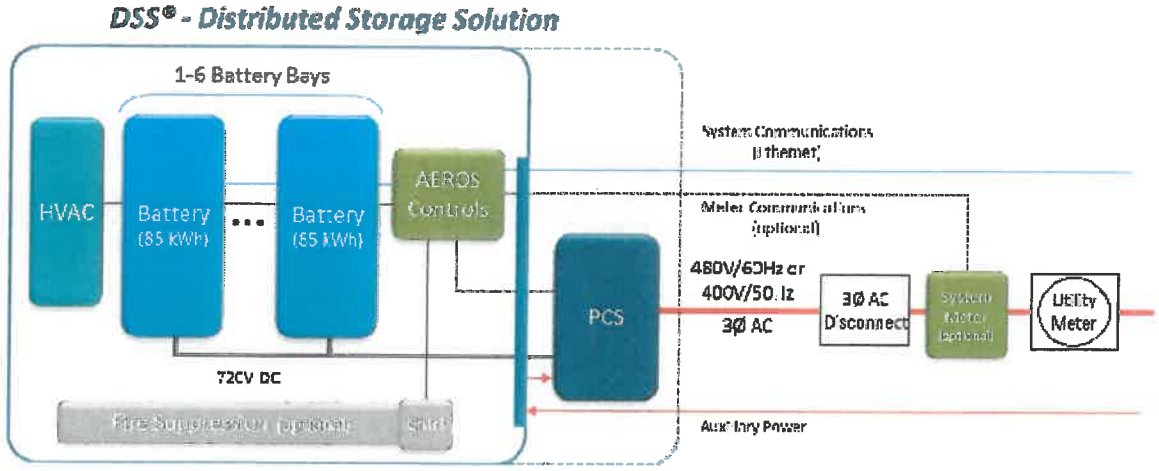
Robust Safety
System safety can never be compromised, and DSS® systems use the same multi-level safety approach — at the cell, module, rack, and system level — for which NEC Energy Solutions is known. Integrated fire suppression is also available as an option.

Installation Simplicity
DSS® systems are designed for fast, straightforward installation by typical commercial electrical contractors. Power and communications connections are conventional and common to standard industrial grade facility products.

System Characteristics	
Energy Options	85, 170, 255, 340, 425 and 510 kWh
Power Conversion Options	100, 280, and 710 kW[1]
DC Voltage	720 V
Controls	AEROS® Applications Suite
AC Interfaces	480V / 60Hz or 400VAC / 50Hz 3Ø, 4 wire
Communications	Ethernet/IP HTTP/HTTPS Modbus (TCP/IP) Options for DNP3.0, IEC61850
Enclosures	NEMA 4 / IP65, in 2, 4 and 6 bay configurations Separate PCS cabinets rated IP54
Operating Temp	-25°C to 50°C
Standards and Compliance (partial list)	UL 9540, 1973, 1642 IEC 61508, 62040-1; UN 38.3, CE, NFPA 70 FCC CPR Part 15, Class A IEC 61000-6-2,4,5 & -7 PCS: UL 1741(SA), G59/3, IEEE 1547 Seismic: IEEE 693-2005

1. 100, 280 and 710 kW PCS options provided in separate, pre-integrated, remotely mounted cabinets.

EXAMPLE INSTALLATION



NEC ENERGY SOLUTIONS

NEC Energy Solutions, Inc.
Phone: +1.508.497.7319
Web: **www.neces.com**

HEC-US V1500

UTILITY SCALE SOLAR INVERTER

HEC-US V1500

The new Power Electronics HEC-US V1500 outdoor inverters are powerful and reliable 1500Vdc utility scale PV units for the US market. The HEC-US V1500 inverter family has 25 different UL-1741 certified models ranging from 1MW to 3MW with no derating at 50°C and a 98.5% CEC rated efficiency.

Power Electronics designs and manufactures 1700Vdc power converters for market leading customers in the mining, oil & gas and water industries and for the most demanding environments. With up to 7 425KW power modules connected in parallel, the HEC-US V1500 is a multilevel 1500Vdc system built on the Power Electronics expertise in >1,000Vdc systems and the proven Freesun HEC modular topology. The HEC-US V1500 has a standard stainless steel enclosure and best-in-class cooling at 50°C without derating to ensure reliable performance in the most demanding conditions.

Power Electronics offers customized NEC2014 compliant FSDK15 external DC Recombiner cabinets. The FSDK15 includes user specified overcurrent protection up to 400 Amps with 16 or 32 inputs to support higher ratio DC:AC PV designs. FSDK15 cabinets include current monitoring.

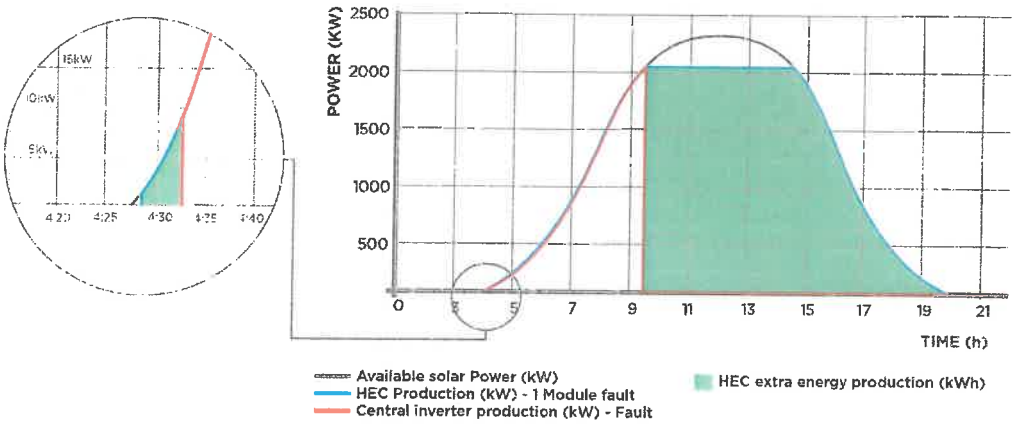
Power Electronics continues to evolve with the solar industry and the HEC-US V1500 is designed specifically to meet the new demand for 1500Vdc PV systems.

THE MOST POWERFUL AND RELIABLE 1500VDC UL-1741 CERTIFIED UTILITY-SCALE PV INVERTER IN THE MARKET

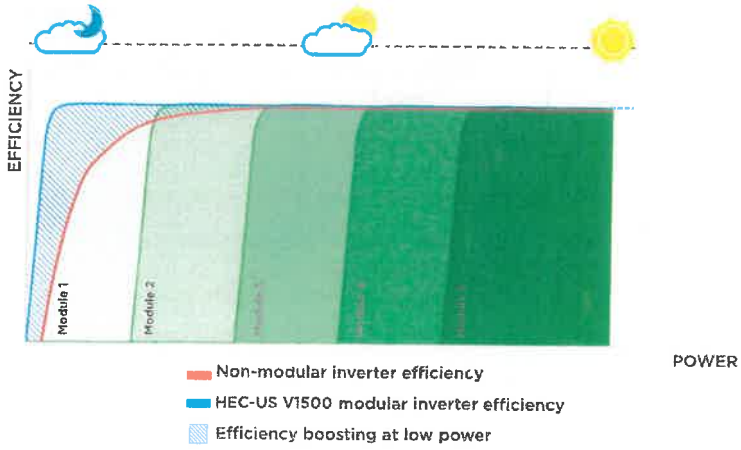
AUTOMATIC REDUNDANT POWER MODULE SYSTEM (ARPMS)

The HEC-US V1500 topology combines the advantages of a central inverter with the availability of string inverters. HEC-US V1500 is a modular central inverter based on an Automatic Redundant Power Module (350kVA to 500kVA per stage).

If there is a fault in one power module, it is taken off-line and its output power is distributed evenly among the remaining functioning modules. All power modules work in parallel controlled by a dual redundant main control. As the main governor of the system it is responsible for the MPPt tracking, synchronization sequence and overall protection. The automatic redundant capability based on our industrial systems is able to shift the main control in the event of a fault, restoring the backup control and restarting the station to guarantee high availability. (patent pending)



A modular inverter is more efficient than a standard central inverter. During low radiation conditions, a modular architecture uses the correct number of power modules to provide power, while a central inverter must consume power internally to support the entire system. With lower losses, a modular inverter can provide power earlier in the morning and stop later at the end of the day. As a result, throughout the entire service life of the PV plant, the HEC-US V1500 inverter generates higher yields than a standard central inverter with a higher reliability than string inverters.

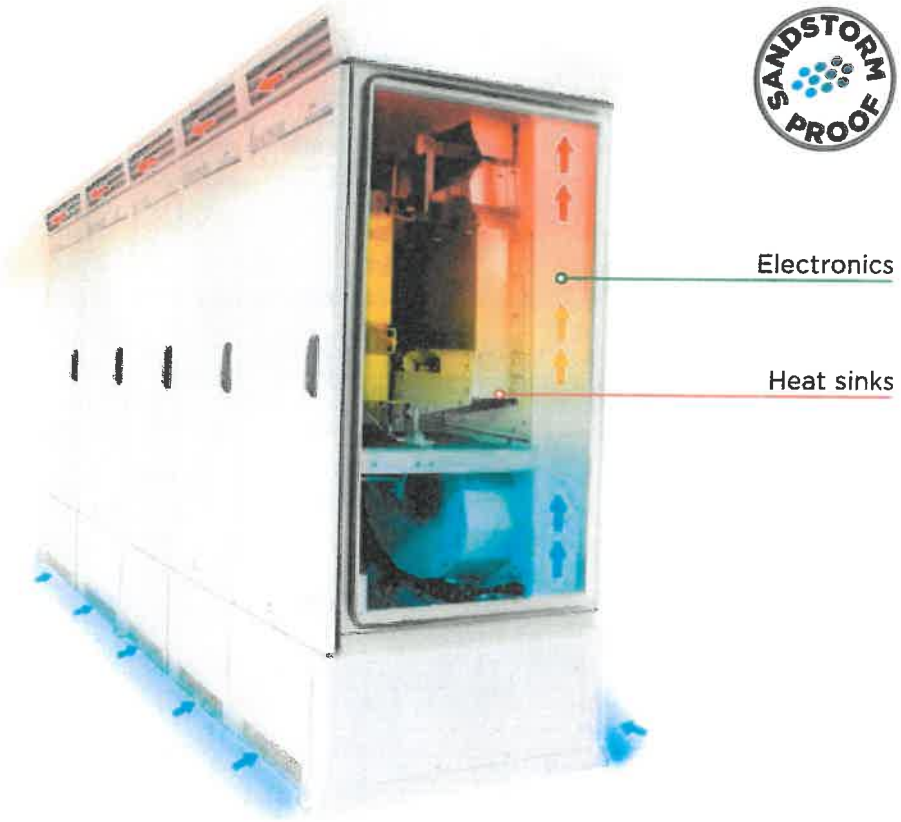


REVOLUTIONARY COOLING SYSTEM

The Power Electronics HEC-US V1500 series includes the innovative and sophisticated iCOOL V performance that allows HEC-US V1500 to work up to 140°F (60°C) at nominal power. The cooling system iCOOL V smartly cools the inverter, regulating the cooling system capacity depending on data from the temperature sensors.

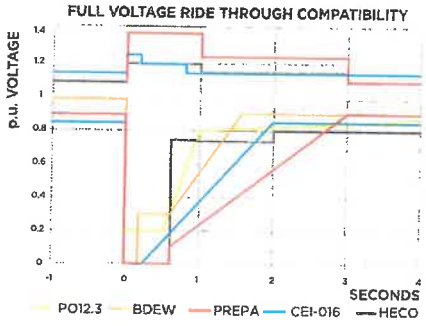
HEC-US V1500 modules are divided into two main areas: clean area (electronics) and hot area (heat sink). The electronics are totally sealed in a NEMA4 area and use a temperature control low flow cooling system that reduces filters clogging and maintenance intervals. The hot area integrates a speed controlled fan for each module, simplifying the cooling system and reducing the maintenance tasks.

Furthermore, due to the modular topology, the iCOOL V reduces the Stand-by consumption at low capacity to the maximum, boosting the cooling capacity for photovoltaic installations situated up to 4000 meters above sea level. (patent pending)

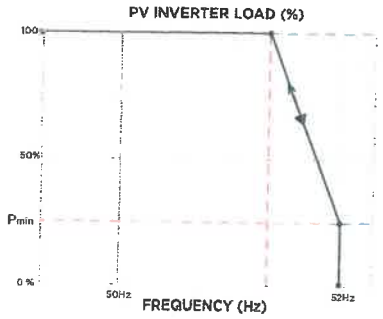


DYNAMIC GRID SUPPORT

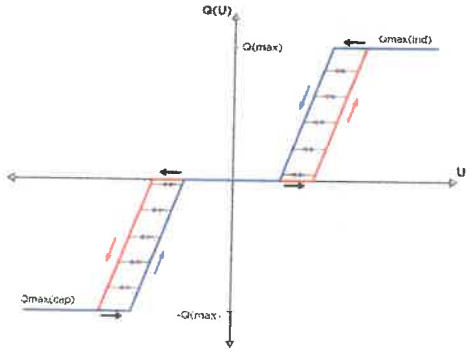
HEC-US V1500 firmware includes the latest utility interactive features (LVRT, OVRT, FRS, FRT, Anti-islanding, active and reactive power curtailment...), and is compatible with all the specific requirements of the utilities.

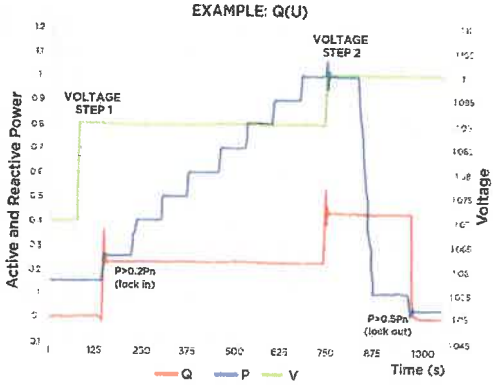


▲ LVRT or ZVRT (Low Voltage Ride Through). Inverters can withstand any voltage dip or profile required by the local utility. The inverter can immediately feed the fault with full reactive power, as long as the protection limits are not exceeded.

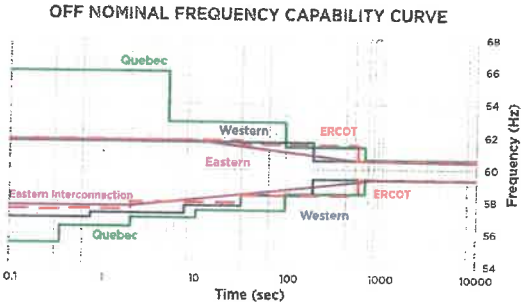


▲ FRS (Frequency Regulation System). Frequency droop algorithm curtails the active power along a preset characteristic curve supporting grid stabilization.

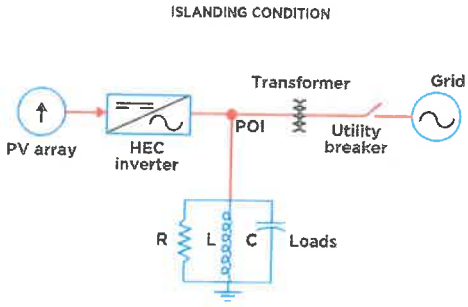




▲ Q(V) curve: It is a dynamic voltage control function which provides reactive power in order to maintain the voltage as close as possible to its nominal value.



▲ FRT (Frequency Ride Through): Freesun solar inverters have flexible frequency protection settings, and can be easily adjusted to comply with future requirements.



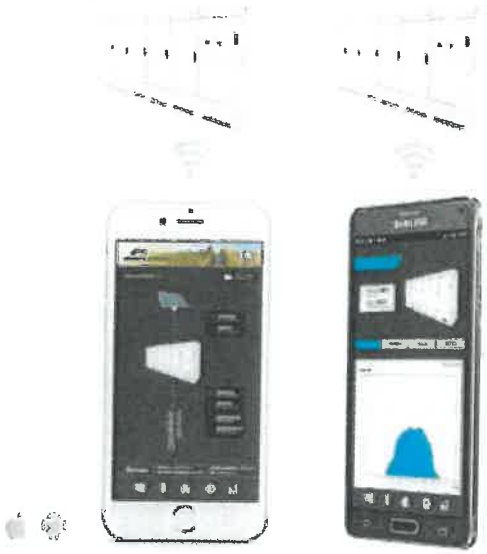
▲ Anti-islanding: This protection combines passive and active methods that eliminates nuisance tripping and reduces grid distortion according to IEC 62116 and IEEE1547.

VAR AT NIGHT

At night, the HEC-US V1500 inverter can shift to reactive power compensation mode. The inverter can respond to an external dynamic signal, a Power Plant Controller command or pre-set reactive power level (kVAr).

EASY TO MONITOR

The Freesun app is the easiest way to monitor the status of our inverters. All our inverters come with built-in wifi, allowing remote connectivity to any smart device for detailed updates and information without the need to open cabinet doors. The app user friendly interface allows quick and easy access to critical information (energy registers, production and events).

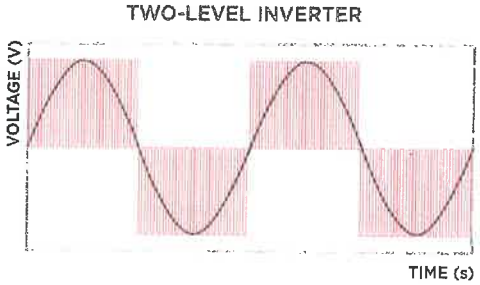


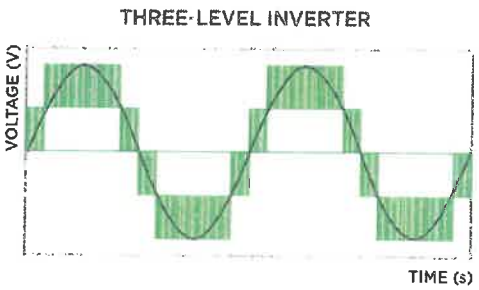
ACTIVE HEATING

At night, when the unit is not actively exporting power, the inverter can import a small amount of power to keep the inverter internal ambient temperature above -20°C, without using external resistors. This autonomous heating system is the most efficient and homogeneous way to prevent condensation, increasing the inverters availability and reducing the maintenance. (patented)

MULTILEVEL TOPOLOGY

The multilevel IGBT topology makes the difference in the 1500Vdc technology, being the most efficient way to manage high DC link voltages. Based in our long IGBT experience components used in the HEC PLUS series, the HEC-US V1500 takes profit of the three level IGBT topology reducing the power stage losses, increasing the efficiency and offering a very low total harmonic distortion.





HEC-US V1500

TECHNICAL CHARACTERISTICS

		690VAC - MPPt Window 976V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1275CU15	FS1700CU15	FS2125CU15	FS2550CU15	FS3000CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1275	1700	2125	2550	3000
	AC Output Power(kVA/kW) @25°C [1]	1530	2040	2550	3060	3500
	AC Output Power(kW) @50°C; PF=0.9	1150	1530	1910	2250	2700
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	690V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	976V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1100V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.5%	98.7%	98.7%	98.7%	98.7%
	CEC (η)	98.0%	98.5%	98.5%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC-6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		645VAC - MPPt Window 913V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
	NUMBER OF MODULES	3	4	5	6	7
	REFERENCE	FS1200CU15	FS1600CU15	FS2000CU15	FS2400CU15	FS2800CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1200	1600	2000	2400	2800
	AC Output Power(kVA/kW) @25°C [1]	1430	1910	2390	2860	3345
	AC Output Power(kW) @50°C; PF=0.9	1080	1440	1800	2160	2520
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	645V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	913V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1075V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.4%	98.5%	98.6%	98.6%	98.6%
	CEC (η)	98.0%	98.0%	98.5%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC-6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

NEW RATINGS

		630VAC - MPPt Window 891V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCE		FS1270CU15	FS1695CU15	FS2120CU15	FS2540CU15	FS3001CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1180	1570	1965	2360	2750
	AC Output Power(kVA/kW) @40°C [1]	1270	1695	2120	2540	3000
	AC Output Power(kVA/kW) @25°C [1]	1400	1870	2340	2800	3275
	Max. AC Output Current (A) @50°C	1080	1440	1800	2160	2520
	Max. AC Output Current (A) @40°C	1165	1550	1940	2330	2715
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	630V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC)	@50°C 891V-1310V / @40°C 891V-1285V / @25°C 891V-1250V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1050V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η) Preliminary	98.5%				
	CEC (η) Preliminary	98.5%				
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC-6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
ENVIRON-MENT	Type of ventilation	Forced air cooling				
	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Power derating >40°C/104°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Compatible with third party SCADA controls				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01 (pending)				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		600VAC - MPPt Window 849V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
	NUMBER OF MODULES	3	4	5	6	7
	REFERENCE	FS1100CU15	FS1475CU15	FS1850CU15	FS2225CU15	FS2600CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1100	1475	1850	2225	2600
	AC Output Power(kVA/kW) @25°C [1]	1335	1780	2225	2660	3110
	AC Output Power(kW) @50°C; PF=0.9	990	1325	1665	2000	2340
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	600V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	849V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1050V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.4%	98.5%	98.6%	98.6%	98.6%
	CEC (η)	98.0%	98.0%	98.5%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC-6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

HEC-US V1500

TECHNICAL CHARACTERISTICS

		565VAC - MPPt Window 800V-1310V				
		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
	NUMBER OF MODULES	3	4	5	6	7
	REFERENCE	FS1050CU15	FS1400CU15	FS1750CU15	FS2100CU15	FS2450CU15
OUTPUT	AC Output Power(kVA/kW) @50°C [1]	1050	1400	1750	2100	2450
	AC Output Power(kVA/kW) @25°C [1]	1250	1675	2090	2510	2930
	AC Output Power(kW) @50°C; PF=0.9	945	1260	1575	1890	2205
	Max. AC Output Current (A) @25°C	1285	1710	2140	2570	3000
	Operating Grid Voltage (VAC)	565V ±10%				
	Operating Grid Frequency (Hz)	60Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi) [2]	0.0 leading ... 0.0 lagging / Reactive Power injection at night				
	Power Curtailment (kVA)	0...100% / 0.1% Steps				
INPUT	MPPt @full power (VDC) [1]	800V - 1310V				
	Maximum DC voltage	1500V				
	Minimum Start Voltage	1050V - User configurable				
	Max. DC continuous current (A)	1600	2140	2675	3210	3745
	Max. DC short circuit current (A)	2320	3100	3880	4650	5450
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.2%	98.4%	98.5%	98.5%	98.5%
	CEC (η)	98.0%	98.0%	98.0%	98.5%	98.5%
	Max. Standby Consumption (Pnight)	< approx. 50W/per module				
	Control Power Supply	120V / 208VAC-6kVA power supply available for external equipment (optional)				
CABINET	Dimensions [WxDxH] [inches]	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] [mm]	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (kg)	2635	3290	3945	4600	5255
	Weight (lbs)	5809	7253	8697	10141	11585
	Air Flow	Bottom intake. Exhaust top rear vent.				
	Type of ventilation	Forced air cooling				
ENVIRON-MENT	Degree of protection	NEMA 3R				
	Permissible Ambient Temperature	-31°F to +140°F, -35°C[3] to +60°C / Active Power derating >50°C/122°F				
	Relative Humidity	0% to 100% non condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [4]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional				
	Keyed ON/OFF switch	Standard				
	Digital I/O	User configurable				
	Analog I/O	User configurable				
PROTECTIONS	Ground Fault Protection	Floating PV array: Isolation Monitoring per MPP NEC2014 Grounded PV Array: GFDI protection Optional PV Array transfer kit: GFDI and Isolation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Module AC Protection & Disconn.	AC contactor & fuses				
	Module DC Protection	DC fuses				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTI-FICA-TIONS	Safety	UL 1741; CSA 22.2 No.107.1-01				
	Utility interconnect	IEEE 1547 with Utility Interactive Control functions				

NOTES [1] Values at 1.00•Vac nom and cos Φ= 1. Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: $Q(kVAr)=\sqrt{(S(kVA)^2-P(kW)^2)}$
[3] Heating kit option required below -20°C.
[4] Sound pressure level at a distance of 1m from the rear part.

MAXIMUM YIELD AND RELIABILITY

POWER ELECTRONICS

PURE ENERGY

ENERGY STORAGE POWER QUALITY

PURE ENERGY

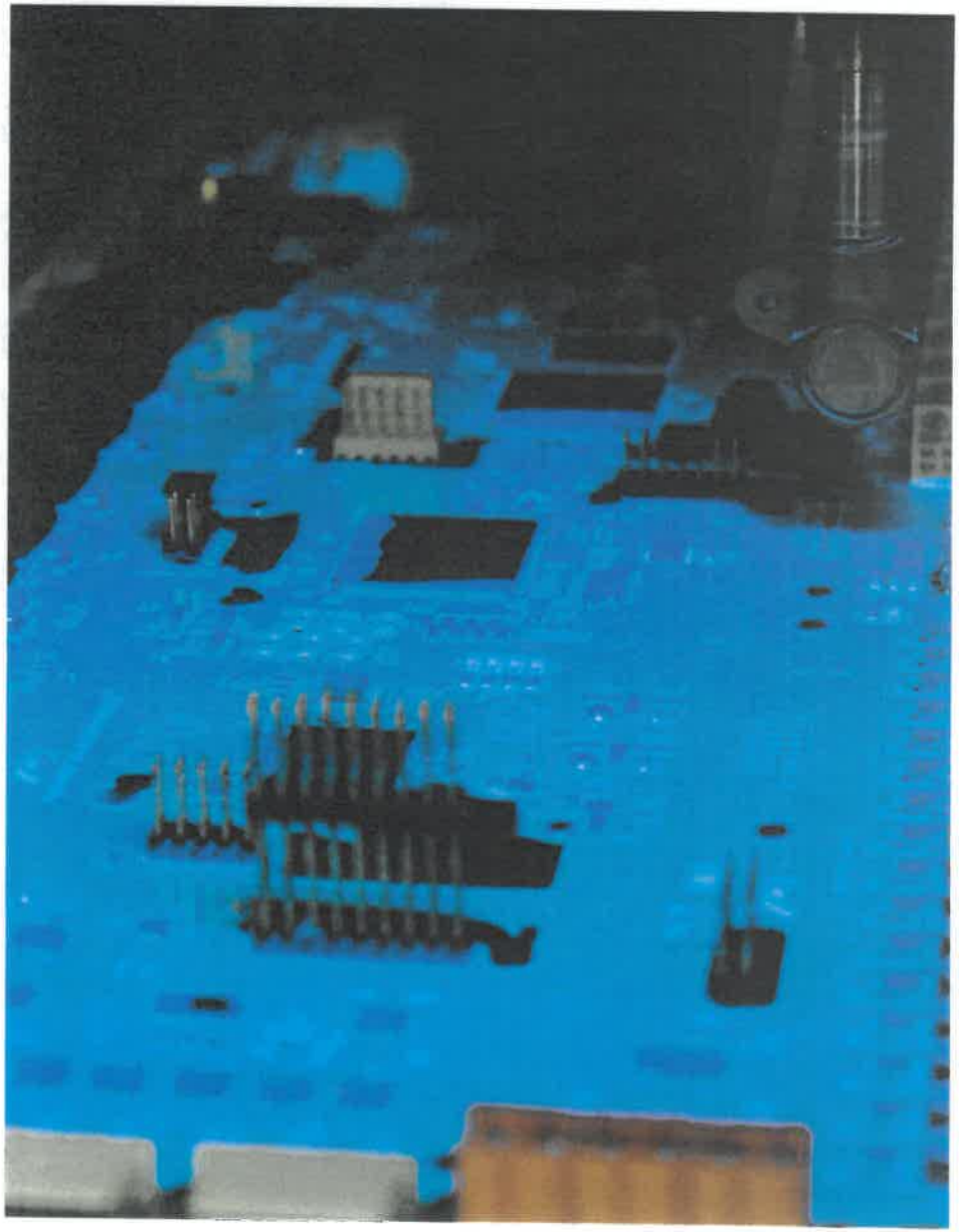
Pure Energy is our motivation for leading the renewable energy generation, it is the search for product and service perfection, it is our vision of a world, clean and sustainable for our children and future generations.

CONTENTS

Since 1987 Power Electronics Industrial division has been producing high power variable speed drives and soft starters for low and medium voltage AC motor applications. This experience has allowed Power Electronics to position itself as the leading manufacturer of utility scale solar inverters thanks to our unique product features, patented designs, fastest global delivery times and unbeatable 24/7 Power on Support. Power Electronics fully designs and manufactures its Freemaq converters in Valencia, Spain and is proud to have some of the most advanced R&D laboratories and factories in the industry.

- **30 YEARS OF PRODUCT EXCELLENCE**
- **24/7 POWER ON SUPPORT**
- **INTERNATIONAL PRESENCE**
- **FINANCIAL STABILITY AND STRENGTH**
- **INDEPENDENT REPORTS AND CERTIFICATIONS**
- **SUSTAINABLE GROWTH**

"We design, manufacture and test the electronic boards of all our products"



ENGINEERING & CONSULTING

Energy projects often require customer specific solutions, for this reason our clients also have our Engineering and Consulting department at their disposal, which comprise a wide number of highly skilled and experienced engineers that are available to modify our standard product to suit customer demands and ensure our clients get the product they need.

TECHNICAL ADVICE
ENGINEERING
CUSTOMIZED SOLUTIONS
PROJECT MANAGEMENT
COMMISSIONING
24/7 SERVICE

VERTICAL INTEGRATION

Flexibility and specialization play a key role in the manufacture of standard products, but even more so in personalized products. We design and manufacture integrally the mechanics of our equipment. Vertical integration gives us the flexibility to adapt to customer requirements and still provide very short delivery times.

INNOVATION & DESIGN FLEXIBILITY
HIGH QUALITY COMPONENTS
RELIABLE ENGINEERING
FACTORY TESTED
VALUE CHAIN SUPERVISION
IMMEDIATE DELIVERY

AVAILABILITY

COMMISSIONING

CUSTOMER SUPPORT

ONSITE ASSISTANCE

SPARE PARTS WARRANTY

TRAINING SEMINARS

WARRANTY

POWER ON SUPPORT

Power on Support is the concept of a customer oriented strategy implemented by Power Electronics since its origins more than 30 years ago with 24/7 after sales service available for all our customers and end users without the need of signing an O&M contract.

Customer Oriented Strategy.

WORLDWIDE PRESENCE

From the beginning, customer service and internationalization have been key elements for the development of the company. Thanks to the global expansion in the five continents, today we have presence and provide technical service throughout the world.

HEADQUARTERS

+20
DELEGATIONS

+100
SALES COUNTRIES

+12GW
INVERTERS INSTALLED

+12GW
ANNUAL CAPACITY PRODUCTION

ROBUST DESIGN

Polymeric Painting

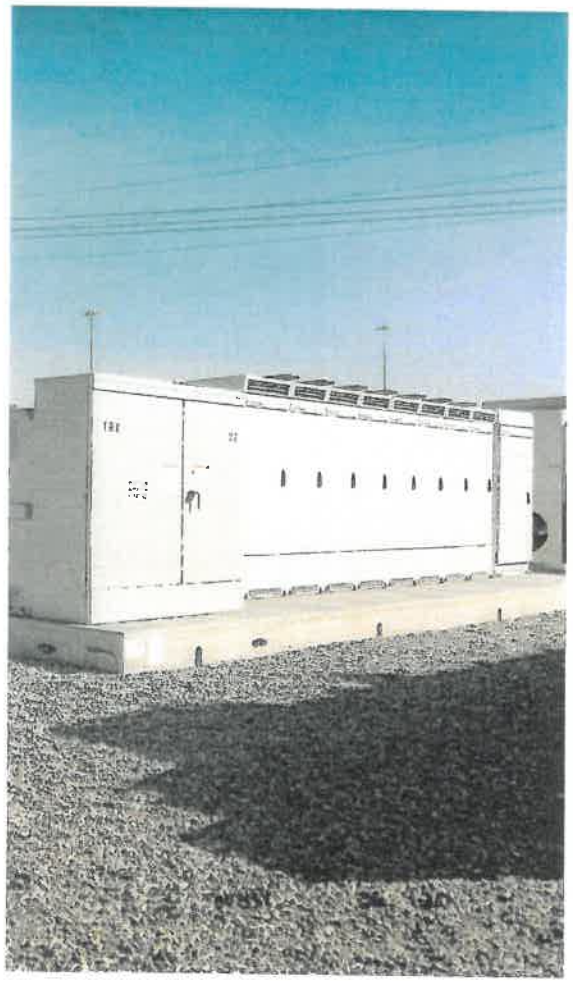
Closed-Cell Insulation

Galvanized Steel | Stainless Steel (Optional)

Freemaq series has been designed to last for more than 30 years of operation in harsh environments and extreme weather conditions. Freemaq units are tested and ready to withstand conditions from the frozen siberian tundra to the californian Death Valley, featuring:

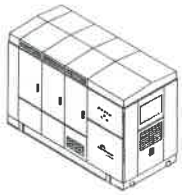
- Totally sealed electronics cabinet protects electronics against dust and moisture.
- Conformal coating on electronic boards shields PCBs from harsh atmospheres.
- Temperature and humidity controlled active heating prevents internal water condensation.
- Galvanized Steel construction with 2mm thickness for maximum enclosure longevity. (Stainless Steel Optional)
- Closed-Cell insulation panel isolates the cabinet from solar heat gains.
- Roof cover designed to dissipate solar radiation, reduce heat build-up and avoid water leakages. The solid structure avoids the need of additional external structures.
- Random units selected to pass a Factory Water Tightness Test ensuring product quality.
- C4 degree of protection according to ISO 12944. Up to C5-M optional.

PRODUCT RANGE

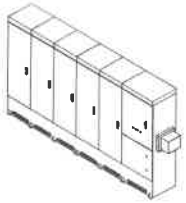


ENERGY STORAGE

FREEMAQ DC/DC
500 kW - 3000 kW
P. 15



FREEMAQ PCSK
1500 kW - 3800 kW
480 Vac - 690 Vac
P. 21



FREEMAQ PCS
1850 kW - 3800 kW
370 Vac - 690 Vac
P. 41

FREEMAQ MULTI PCS
1600 kW - 3800 kW
480 Vac - 690 Vac
P. 55

POWER QUALITY

FREEMAQ STATCOM
Static Compensator
2300 VAr - 3800 VAr
P. 67

ACCESSORIES

POWER PLANT CONTROLLER
P. 73

FREEMAQ DC/DC

BI-DIRECTIONAL DC/DC CONVERTER

- MODULAR DESIGN
- OUTDOOR DURABILITY
- CLIPPING RECOVERY CAPABILITY
- FOR NEW AND EXISTING PLANTS

THE MOST COST COMPETITIVE SOLUTION FOR SOLAR + STORAGE INSTALLATIONS

The new Power Electronics Freemaq DC/DC is a bi-directional DC converter designed to maximize the benefits of the large-scale solar plants with a solar-plus-storage approach, offering a cuttingedge technology product that is able to reduce the CAPEX of PV installations coupled with energy storage systems, avoiding the installation of an additional station with a dedicated MV transformer.

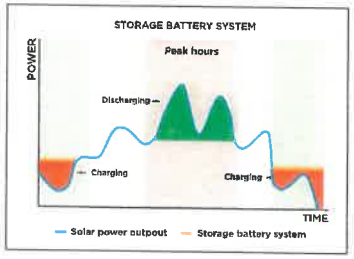
Following the Power Electronics philosophy, the Freemaq DC/DC is a modular outdoor solution available from 500kW to 3000kW, fully compatible with different battery technologies and manufacturers, with a voltage range up to 1500Vdc and the highest efficiency in the market. This product has been designed to be easily integrated with a Freesun inverter in new or already installed PV power plants, being the most cost-competitive solution for battery storage systems paired with PV installations.

By coupling the Power Electronics Freemaq DC/DC converter with a Freesun solar inverter, it is possible to perform functions such as: energy shifting, ramp control rate, frequency response, and most importantly, clipping energy recovery, that will boost customer revenues.

ENERGY STORAGE APPLICATIONS

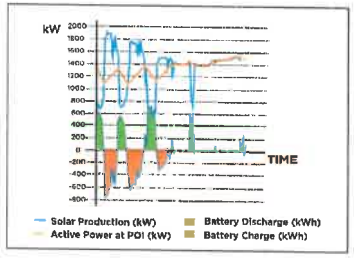
LOAD LEVELING

Freemaq DC/DC series are able to store energy during periods of low demand from the grid, in order to later supply this energy when there is a higher demand. This has the benefit of selling the energy at a higher market price during peak periods. It also allows grid operators to supply electricity with a higher renewable origin. Since PV generation may not be at the same time as peak demand, this facilitates the flexibility and integration of renewable generation into the grid.



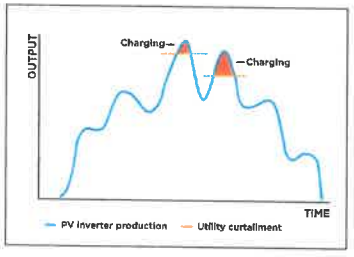
RENEWABLE INTEGRATION

The Freemaq DC/DC series attenuates the intermittent nature of renewable energy sources, to provide a smoother power output. The Freemaq DC/DC controls the ramp rate at which power is injected into the grid, and thus reduces the impact of rapid power fluctuations due to sudden or transient conditions experienced by the PV array. The system monitors the PV inverter output to inject or consume power accordingly to ensure the output remains within the ramp requirements.



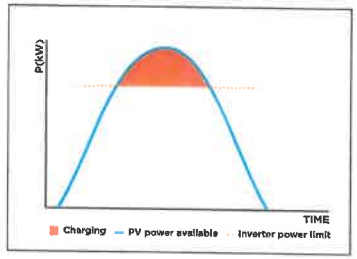
UTILITY CURTAILMENT RECOVERY

Utility scale inverter production can be curtailed by the grid operator, due to the high energy sources penetration in the grid during certain periods. With this AC-coupled energy storage system, the excess energy from the PV field can be stored in the Battery Energy Storage System (BESS) and then delivered when needed.



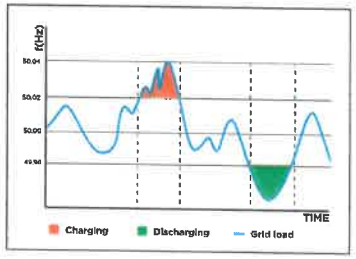
CLIPPING RECOVERY

The Power Electronics Freemaq DC/DC gets the maximum revenues from the PV generator, by charging the battery storage system when the PV inverter is clipping the output power, due to the high DC/AC power ratios. This stored energy can be exported to the utility grid when the price per KWh is high.



FREQUENCY REGULATION SYSTEM

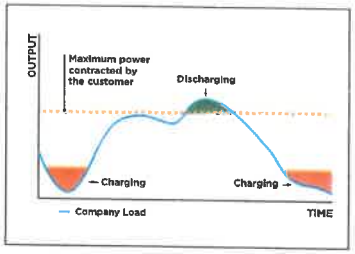
Freemaq DC/DC provides ability to regulate grid frequency in both directions. When there is a grid overfrequency (generation>demand) inverter power output is curtailed and this energy is stored. When there is a grid under-frequency (generation<demand) inverter power output is increased by discharging the batteries and injecting more power to the grid.



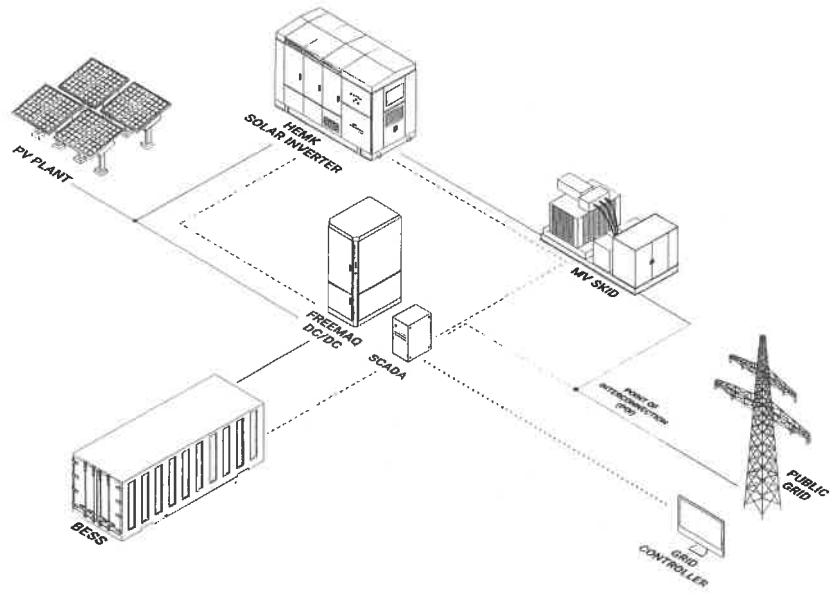
PEAK POWER SHAVING

By delivering stored energy to the grid during periods of high demand, it reduces the burden on the distribution network and increases significantly its efficiency.

Energy is stored during periods of low demand increasing the load on the grid. During peak periods this stored energy is then injected into the grid reducing the demand at this time. The result is a more flattened demand curve which means the grid can avoid switching on more expensive and polluting generators.



CONFIGURATION



Power connections

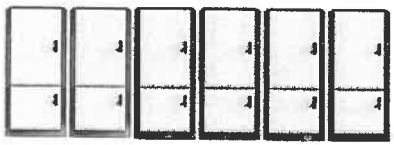
Plant communications

Grid controller communication

MODULAR DESIGN

Its unique modular design provides the flexibility needed to design your project, choosing the amount of storage power to be dispatched, according to the specific grid requirements.

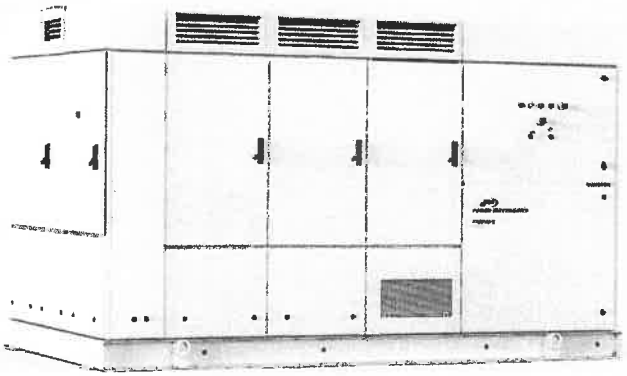
From 500 kW to 3MW.



TECHNICAL CHARACTERISTICS

REFERENCE		FD0500
DC INPUT & OUTPUT	DC Rated Power (kW) @50°C	500
	DC PV Voltage Range (Vdc)	800 to 1310
	DC ESS Voltage Range (Vdc)	700 to 1310
	Maximun DC PV Input Voltage (Vdc)	1500
	DC Voltage Ripple	<3%
	Battery Technology	Compatible with all battery technologies
EFFICIENCY	Efficiency (Max)	98.5% (target)
	Max. Standby Consumption	< apiprox. 50W
CABINET	Dimensions(mm)	1000x1200x1800
	Cooling	Forced air
	Enclosure Rating	NEMA 3R / IP54
CONNECTIONS	Number of connections	3 positive / 3 negative
	Terminals	Lugs Rated 90°C
	Max. positive and negative input wire size	750 kcmil / 380mm²
ENVIRONMENT	Operating Temperature range	-35°C to 50°C
	Relative Humidity	4% to 95% non condensing
	Max. Altitude	4000m; >2000m power derating
	Audible Noise level	<79 dBA
CONTROL INTERFACE	Interfaces	Graphic display (Freesun cabinet)
		Emergency pushbutton and indicator lights
		USB, RJ45 and RS 485
		Freesun App
	Communications Protocol	Modbus TCP, Modbus RTU
PROTECTIONS	Ground Fault Detection	Insulation monitoring device
	DC disconnection & protection (PV)	Built-in
	DC disconnection	Optional
	Battery overvoltage protection	Optional
CERTIFICATIONS	Safety Certification	UL-1741 (pending)

[1] For other range consult Power Electronics.
[2] Heating resistors kit option below -20°C.



FREEMAQ PCSK

UTILITY SCALE BATTERY INVERTER

- POWER CONVERSION SYSTEM
- FRU — FIELD REPLACEABLE UNITS
- MODULAR DESIGN
- ICOOL 3
- 4Q — 4 QUADRANT
- 3 LEVEL TOPOLOGY
- IP65 — IP65 AVAILABLE

PROVEN HARDWARE AND ROBUST OUTDOOR DESIGN FEATURED WITH THE LATEST CONTROL

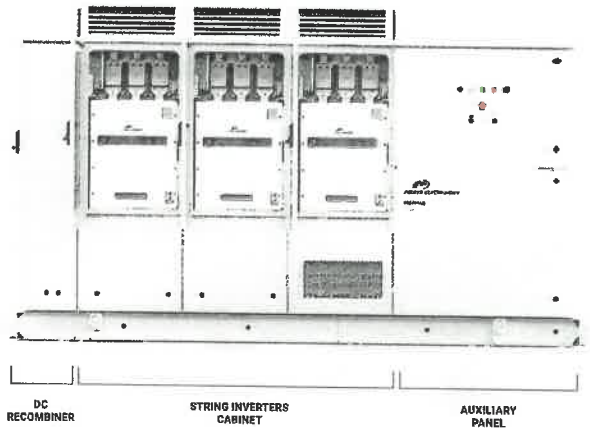
The Freemaq PCSK is a modular solution from 1600kW to 3800kW with configurable DC and AC voltages making it compatible with all battery technology and manufacturers. Power Electronics is a proven partner in the solar and energy storage market. The Power Electronics Freemaq PCSK offers proven hardware to meet storage and grid support challenges.The energy production industry is embracing renewable energy sources. However, high penetration creates power transmission instability challenges, thus Grid Operators require stringent dynamic and static grid support features for solar inverters and Power Conversion Systems (PCS).

The Freemaq PCSK can perform grid support functions such as: Peak Shaving, Ramp Rate Control, Frequency Regulation, Load Leveling and Voltage Regulation, controlled by a Power Plant Controller or SCADA. The Freemaq PCSK stations are turn-key solutions ready for connection to the battery container and MV power distribution wiring. Units are designed for concrete pads or piers, open skids or integrated into full container solutions.

COMPACT DESIGN - EASY TO SERVICE

By providing full front access the Freemaq PCSK series simplifies the maintenance tasks, reducing the MTTR (and achieving a lower OPEX). The total access allows a fast swap of the FRUs without the need of qualified technical personnel.

With the Freemaq PCSK, Power Electronics offers its most compact solution, achieving 3.8MW in just 12ft long, reducing installation costs and labor time.

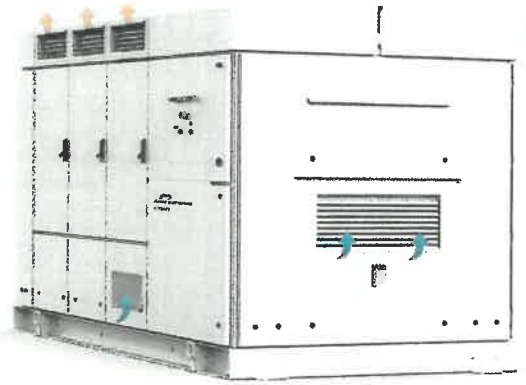


STRING CONCEPT POWER STAGES

The Freemaq PCSK combines the advantages of a central inverter with the modularity of the string inverters. Its power stages are designed to be easily replaceable on the field without the need of advanced technical service personnel, providing a safe, reliable and fast Plug&Play assembly system. Following the modular philosophy of the Freemaq series, the unit is composed of 6 FRUs (field replaceable units), being able to work with up to 6 independent DC inputs.

INNOVATIVE COOLING SYSTEM

Based on more than 3 years of experience with our MV Variable Speed Drive, the iCOOL3 is the first air-cooling system allowing IP65 degree of protection in an outdoor converter. iCOOL3 delivers a constant stream of clean air to the FRUs, being the most effective way of reaching up to IP65 degree of protection, without having to maintain cumbersome dust filters or having to use liquid-cooling systems, avoiding the commonly known inconveniences of it (complex maintenance, risk of leaks, higher number of components...), therefore resulting in an OPEX cost reduction.



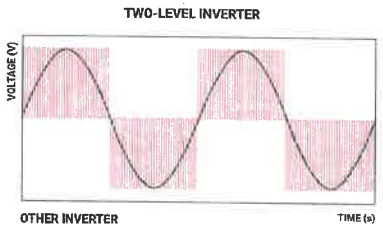
ACTIVE HEATING

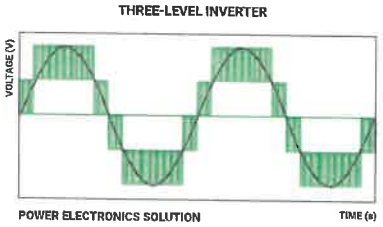
When the unit is not actively exporting power, the inverter can import a small amount of power to keep the inverter internal ambient temperature above -20°C, without using external resistors.

This autonomous heating system is the most efficient and homogeneous way to prevent condensation, increasing the inverters availability and reducing the maintenance. **PATENTED**

MULTILEVEL TOPOLOGY

The multilevel IGBT topology is the most efficient approach to manage high DC link voltages and makes the difference in the 1,500 Vdc design. Power Electronics has many years of power design in both inverters and MV drives and the Freemaq PCSK design is the result of our experience with 3 level topologies. The 3 level IGBT topology reduces stage losses, increases inverter efficiency and minimizes total harmonic distortion.





EASY TO MONITOR

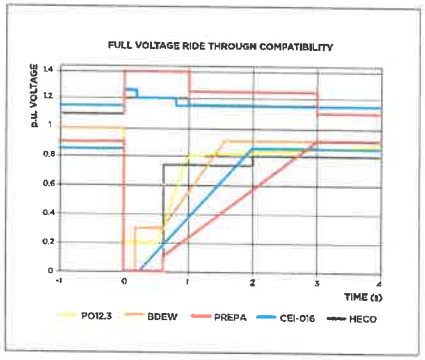
The Freesun app is the easiest way to monitor the status of our inverters. All our inverters come with built-in wifi, allowing remote connectivity to any smart device for detailed updates and information without the need to open cabinet doors.

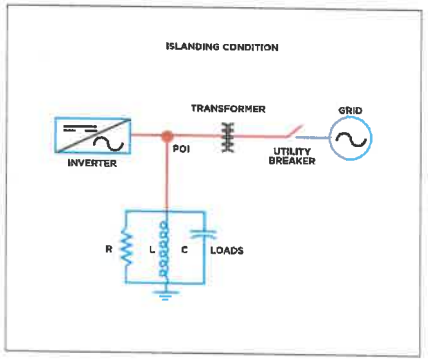
The app user friendly interface allows quick and easy access to critical information (energy registers, production and events).

AVAILABLE INFORMATION	Grid and PV field data. Inverter and Power module data (Voltages, currents, power, temperatures, I/O status...). Weather conditions. Alarms and warnings events. Energy registers. Others.
FEATURES	Easy Wireless connection. Comprehensive interface. Real time data. Save and copy settings.
LANGUAGE	English, Spanish.
SYSTEM REQUIREMENTS	iOS or Android devices.
SETTINGS CONTROL	Yes

DYNAMIC GRID SUPPORT

Freemaq PCSK firmware includes the latest utility interactive features (LVRT, OVRT, FRS, FRT, Anti-islanding, active and reactive power curtailment...), and is compatible with all the specific requirements of the utilities.





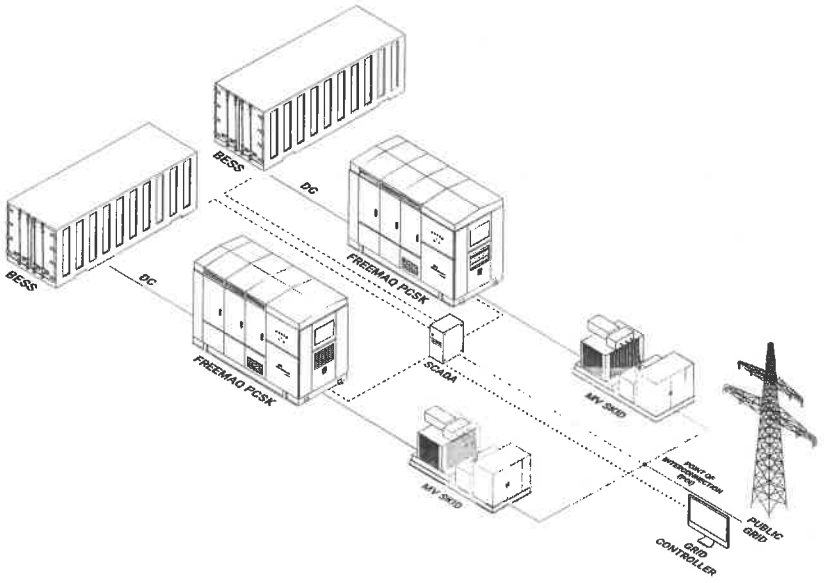
LVRT or ZVRT (Low Voltage Ride Through)
Inverters can withstand any voltage dip or profile required by the local utility. The inverter can immediately feed the fault with full reactive power, as long as the protection limits are not exceeded.

Anti-islanding
This protection combines passive and active methods that eliminates nuisance tripping and reduces grid distortion according to IEC 62116 and IEEE1547.

BATTERY ENERGY STORAGE SYSTEM

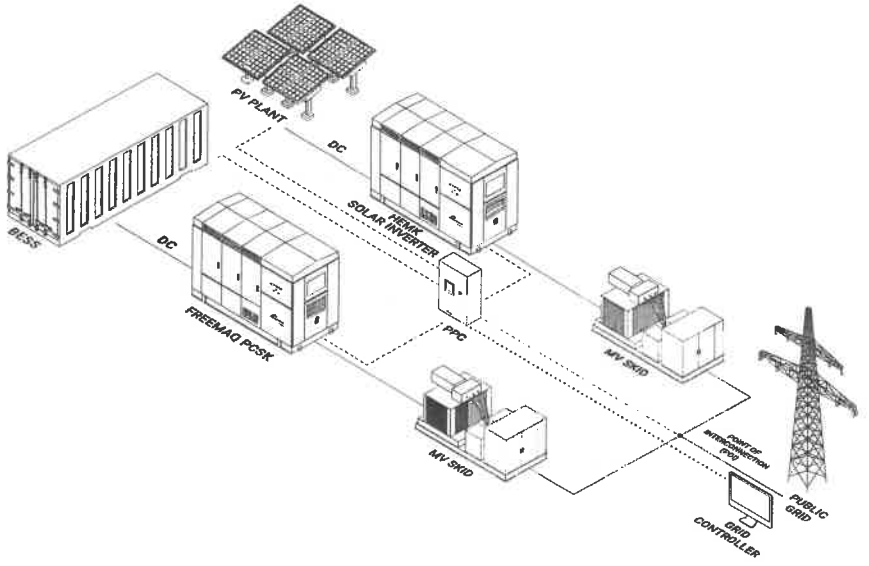
A BESS comprises a battery container connected to a Freemaq PCSK (Power Conversion System) that follows the instruction of the main governor of the plant, the PPC (Power Plant Controller) or SCADA.

EXAMPLE 1



Power connections
Plant communications
Grid controller communication

EXAMPLE 2

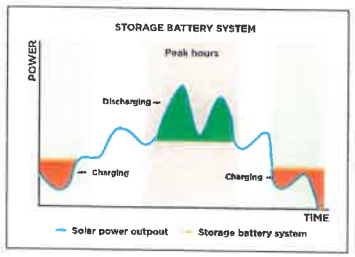


Power connections
Plant communications
Grid controller communication

ENERGY STORAGE APPLICATIONS

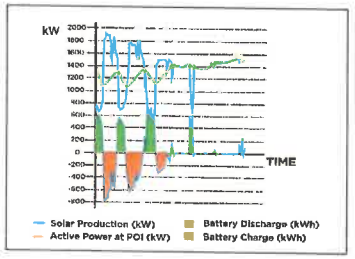
LOAD LEVELING

Freemaq PCSK series are able to store energy during periods of low demand from the grid, in order to later supply this energy when there is a higher demand. This has the benefit of selling the energy at a higher market price during peak periods. It also allows grid operators to supply electricity with a higher renewable origin. Since PV generation may not be at the same time as peak demand, this facilitates the flexibility and integration of renewable generation into the grid.



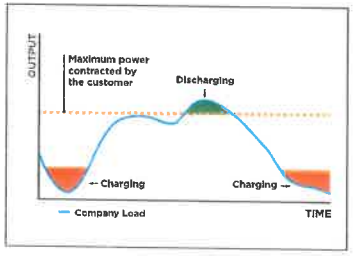
RENEWABLE INTEGRATION

The Freemaq PCSK series attenuates the intermittent nature of renewable energy sources, to provide a smoother power output. The Freemaq PCSK controls the ramp rate at which power is injected into the grid, and thus reduces the impact of rapid power fluctuations due to sudden or transient conditions experienced by the PV array. The system monitors the PV inverter output to inject or consume power accordingly to ensure the output remains within the ramp requirements.



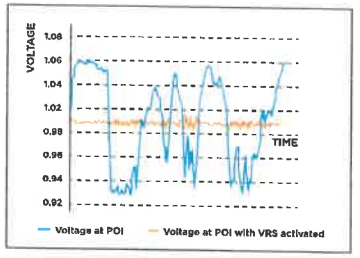
PEAK POWER SHAVING

By delivering stored energy to the grid during periods of high demand, it reduces the burden on the distribution network and increases significantly its efficiency. Energy is stored instead of injected into the grid during periods of low demand, which as a result increases the load on the grid. However, during peak periods this stored energy is then injected into the grid, which reduces the demand at this time. The result is a more flattened demand curve which means the grid can avoid switching on more expensive and polluting generators.



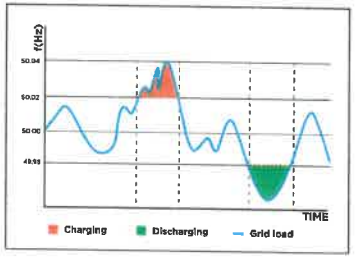
GRID SUPPORT

Freemaq PCSK series helps the integration of renewable sources, by helping to maintain grid stability and power quality. It can help support the grid voltage by generating capacitive or inductive current.Other features include Voltage Control, Reactive Power Control and Fault Ride Through Support.



FREQUENCY REGULATION SYSTEM

Freemaq PCSK provides ability to regulate grid frequency in both directions. When there is a grid overfrequency (generation>demand) inverter power output is curtailed and this energy is stored. When there is a grid under-frequency (generation<demand) inverter power output is increased by discharging the batteries and injecting more power to the grid.



TECHNICAL CHARACTERISTICS

FREEMAQ PCSK 690V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		**FP2300K**	**FP3450K**
AC	AC Output Power (kVA/kW) @50°C[1]	2300	3450
	AC Output Power (kVA/kW) @25°C[1]	2530	3800
	Max. AC Output Current (A) @50°C	1925	2887
	Max. AC Output Current (A) @25°C	2117	3175
	Overload capacity [2]	110% (depending on preload conditions)	
	Operating Grid Voltage (VAC)	690V ±10% [3]	
	Operating Grid Frequency (Hz)	50/60 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi)[2]	0.5 leading...0.5 lagging	
	Reactive power compensation	Four quadrant operation	
DC	DC Voltage Range (full power)	976V-1310V	
	Maximum DC voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC continuous current (A)	2646	3969
	Battery Technology	All type of batteries (BMS required)	
	Battery Connections	Up to 18 positive and 18 negative connections	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level [5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional[3]	
	Analog I/O	Optional[3]	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	General DC Protection & Disconn.	Fuses + Contactors	
	Overvoltage Protection	AC and DC protection (type 2)	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2	
	Utility interconnect	UL1741SA / IEEE1547.1	

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCSK 660V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		**FP2200K**	**FP3300K**
AC	AC Output Power (kVA/kW) @50°C[1]	2200	3300
	AC Output Power (kVA/kW) @25°C[1]	2420	3630
	Max. AC Output Current (A) @50°C	1925	2887
	Max. AC Output Current (A) @25°C	2117	3175
	Overload capacity [2]	110% (depending on preload conditions)	
	Operating Grid Voltage (VAC)	660V ±10% [3]	
	Operating Grid Frequency (Hz)	50/60 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi)[2]	0.5 leading...0.5 lagging	
	Reactive power compensation	Four quadrant operation	
DC	DC Voltage Range (full power)	934V-1310V	
	Maximum DC voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC continuous current (A)	2646	3969
	Battery Technology	All type of batteries (BMS required)	
	Battery Connections	Up to 18 positive and 18 negative connections	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level [5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional[3]	
	Analog I/O	Optional[3]	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	General DC Protection & Disconn.	Fuses + Contactors	
	Overvoltage Protection	AC and DC protection (type 2)	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2	
	Utility interconnect	UL1741SA / IEEE1547.1	

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCSK 645V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		FP2150K	FP3225K
AC	AC Output Power (kVA/kW) @50°C[1]	2150	3225
	AC Output Power (kVA/kW) @25°C[1]	2365	3550
	Max. AC Output Current (A) @50°C	1925	2887
	Max. AC Output Current (A) @25°C	2117	3175
	Overload capacity [2]	110% (depending on preload conditions)	
	Operating Grid Voltage (VAC)	645V ±10% [2]	
	Operating Grid Frequency (Hz)	50/60 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi)[2]	0.5 leading...0.5 lagging	
	Reactive power compensation	Four quadrant operation	
DC	DC Voltage Range (full power)	913V-1310V	
	Maximum DC voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC continuous current (A)	2646	3969
	Battery Technology	All type of batteries (BMS required)	
	Battery Connections	Up to 18 positive and 18 negative connections	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level[5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional[3]	
	Analog I/O	Optional[3]	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	General DC Protection & Disconn.	Fuses + Contactors	
	Overvoltage Protection	AC and DC protection (type 2)	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2	
	Utility interconnect	UL1741SA / IEEE1547.1	

[1] Values at 1.00·Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCSK 630V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		FP2100K	FP3150K
AC	AC Output Power (kVA/kW) @50°C[1]	2100	3150
	AC Output Power (kVA/kW) @25°C[1]	2310	3465
	Max. AC Output Current (A) @50°C	1925	2887
	Max. AC Output Current (A) @25°C	2117	3175
	Overload capacity [2]	11 0% (depending on preload conditions)	
	Operating Grid Voltage (VAC)	630V ±10% [2]	
	Operating Grid Frequency (Hz)	50/60 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi)[2]	0.5 leading...0.5 lagging	
	Reactive power compensation	Four quadrant operation	
DC	DC Voltage Range (full power)	891V-1310V	
	Maximum DC voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC continuous current (A)	2646	3969
	Battery Technology	All type of batteries (BMS required)	
	Battery Connections	Up to 18 positive and 18 negative connections	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level[5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional[3]	
	Analog I/O	Optional[3]	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	General DC Protection & Disconn.	Fuses + Contactors	
	Overvoltage Protection	AC and DC protection (type 2)	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2	
	Utility Interconnect	UL1741SA / IEEE1547.1	

[1] Values at 1.00·Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCSK 615V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		FP2050K	FP3075K
AC	AC Output Power (kVA/kW) @50°C[1]	2050	3075
	AC Output Power (kVA/kW) @25°C[1]	2255	3380
	Max. AC Output Current (A) @50°C	1925	2887
	Max. AC Output Current (A) @25°C	2117	3175
	Overload capacity [2]	110% (depending on preload conditions)	
	Operating Grid Voltage (VAC)	615V ±10% [3]	
	Operating Grid Frequency (Hz)	50/60 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi)[2]	0.5 leading...0.5 lagging	
	Reactive power compensation	Four quadrant operation	
DC	DC Voltage Range (full power)	870V-1310V	
	Maximum DC voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC continuous current (A)	2646	3969
	Battery Technology	All type of batteries (BMS required)	
	Battery Connections	Up to 18 positive and 18 negative connections	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level [5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional[3]	
	Analog I/O	Optional[3]	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	General DC Protection & Disconn.	Fuses + Contactors	
	Overvoltage Protection	AC and DC protection (type 2)	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2	
	Utility interconnect	UL1741SA / IEEE1547.1	

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCSK 600V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		FP2000K	FP3000K
AC	AC Output Power (kVA/kW) @50°C[1]	2000	3000
	AC Output Power (kVA/kW) @25°C[1]	2200	3300
	Max. AC Output Current (A) @50°C	1925	2887
	Max. AC Output Current (A) @25°C	2117	3175
	Overload capacity [2]	110% (depending on preload conditions)	
	Operating Grid Voltage (VAC)	600V ±10% [3]	
	Operating Grid Frequency (Hz)	50/50 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi)[2]	0.5 leading...0.5 lagging	
	Reactive power compensation	Four quadrant operation	
DC	DC Voltage Range (full power)	849V-1310V	
	Maximum DC voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC continuous current (A)	2646	3969
	Battery Technology	All type of batteries (BMS required)	
	Battery Connections	Up to 18 positive and 18 negative connections	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level [5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional[3]	
	Analog I/O	Optional[3]	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	General DC Protection & Disconn.	Fuses + Contactors	
	Overvoltage Protection	AC and DC protection (type 2)	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2	
	Utility interconnect	UL1741SA / IEEE1547.1	

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCSK 530V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		FP1765K	FP2650K
AC	AC Output Power (kVA/kW) @50°C[1]	1765	2650
	AC Output Power (kVA/kW) @25°C[1]	1940	2915
	Max. AC Output Current (A) @50°C	1925	2887
	Max. AC Output Current (A) @25°C	2117	3175
	Overload capacity [2]	110% (depending on preload conditions)	
	Operating Grid Voltage (VAC)	530V ±10% [2]	
	Operating Grid Frequency (Hz)	50/60 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi)[2]	0.5 leading...0.5 lagging	
	Reactive power compensation	Four quadrant operation	
DC	DC Voltage Range (full power)	750V-1310V	
	Maximum DC voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC continuous current (A)	2646	3969
	Battery Technology	All type of batteries (BMS required)	
	Battery Connections	Up to 18 positive and 18 negative connections	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level [5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional[3]	
	Analog I/O	Optional[3]	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	General DC Protection & Disconn.	Fuses + Contactors	
	Overvoltage Protection	AC and DC protection (type 2)	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2	
	Utility interconnect	UL1741SA / IEEE1547.1	

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCSK 500V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		FP1665K	FP2500K
AC	AC Output Power (kVA/kW) @50°C[1]	1665	2500
	AC Output Power (kVA/kW) @25°C[1]	1830	2750
	Max. AC Output Current (A) @50°C	1925	2887
	Max. AC Output Current (A) @25°C	2117	3175
	Overload capacity [2]	110% (depending on preload conditions)	
	Operating Grid Voltage (VAC)	500V ±10% [2]	
	Operating Grid Frequency (Hz)	50/60 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi)[2]	0.5 leading...0.5 lagging	
	Reactive power compensation	Four quadrant operation	
DC	DC Voltage Range (full power)	708V-1310V	
	Maximum DC voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC continuous current (A)	2646	3969
	Battery Technology	All type of batteries (BMS required)	
	Battery Connections	Up to 18 positive and 18 negative connections	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level [5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional[3]	
	Analog I/O	Optional[3]	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	General DC Protection & Disconn.	Fuses + Contactors	
	Overvoltage Protection	AC and DC protection (type 2)	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2	
	Utility interconnect	UL1741SA / IEEE1547.1	

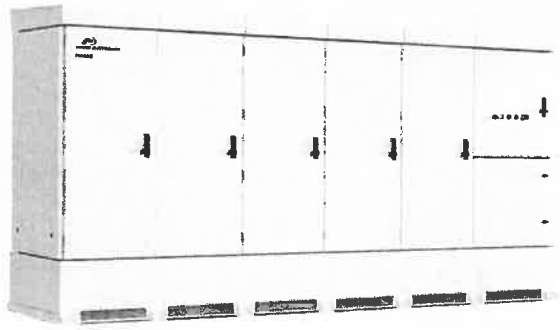
[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCSK 480V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		FP1600K	FP2400K
AC	AC Output Power (kVA/kW) @50°C[1]	1600	2400
	AC Output Power (kVA/kW) @25°C[1]	1760	2640
	Max. AC Output Current (A) @50°C	1925	2887
	Max. AC Output Current (A) @25°C	2117	3175
	Overload capacity [2]	110% (depending on preload conditions)	
	Operating Grid Voltage (VAC)	480V ±10% [3]	
	Operating Grid Frequency (Hz)	50/60 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
	Power Factor (cosine phi)[2]	0.5 leading...0.5 lagging	
	Reactive power compensation	Four quadrant operation	
DC	DC Voltage Range (full power)	679V-1310V	
	Maximum DC voltage	1500V	
	DC Voltage Ripple	< 3%	
	Max. DC continuous current (A)	2646	3969
	Battery Technology	All type of batteries (BMS required)	
	Battery Connections	Up to 18 positive and 18 negative connections	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level [5]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional[3]	
	Analog I/O	Optional[3]	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	General DC Protection & Disconn.	Fuses + Contactors	
	Overvoltage Protection	AC and DC protection (type 2)	
CERTIFICATIONS	Safety	UL1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2	
	Utility interconnect	UL1741SA / IEEE1547.1	

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.



FREEMAQ PCS

UTILITY SCALE BATTERY INVERTER

- POWER CONVERSION SYSTEM
- AUTOMATIC REDUNDANT POWER MODULE SYSTEM
- MODULAR DESIGN
- ICOOL V
- 4 QUADRANT
- 3 LEVEL TOPOLOGY

PROVEN HARDWARE AND ROBUST OUTDOOR DESIGN FEATURED WITH THE LATEST CONTROL

The Freemaq PCS is a modular solution from 690kW to 3000kW with configurable DC and AC voltages making it compatible with all battery technology and manufacturers. Power Electronics is a proven partner in the solar and energy storage market. The Power Electronics Freemaq PCS offers proven hardware to meet storage and grid support challenges.

The energy production industry is embracing renewable energy sources. However, high penetration creates power transmission instability challenges, thus Grid Operators require stringent dynamic and static grid support features for solar inverters and Power Conversion Systems (PCS).

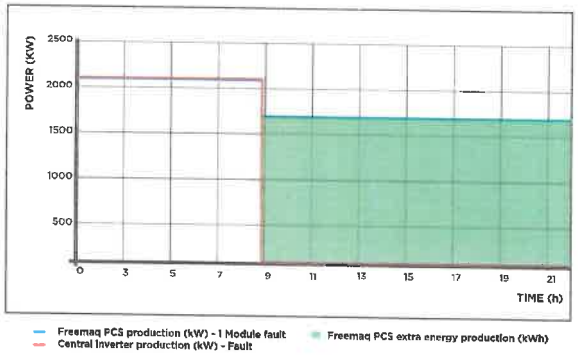
The Freemaq PCS can perform grid support functions such as: Peak Shaving, Ramp Rate Control, Frequency Regulation, Load Leveling and Voltage Regulation, controlled by a Power Plant Controller or SCADA.

The Freemaq PCS stations are turn-key solutions ready for connection to the battery container and MV power distribution wiring. Units are designed for concrete pads, open skids or integrated into full container solutions.

AUTOMATIC REDUNDANT POWER MODULE SYSTEM

Freemaq PCS is a modular central battery inverter based on an Automatic Redundant Power Module (up to 400kVA per stage). If there is a fault in one power module, it is taken off-line and its output power is distributed evenly among the remaining functioning modules. All power modules work in parallel controlled by a dual redundant main control.

As the main governor of the system it is responsible for the battery charge / discharge, synchronization sequence and overall protection. The automatic redundant capability based on our industrial systems is able to shift the main control in the event of a fault, restoring the backup control and restarting the station to guarantee high availability.



VAR SUPPORT

The Freemaq PCS inverter can provide reactive power at any time in order to stabilize the grid conditions. The inverter can respond to an external dynamic signal, a Power Plant Controller command or a pre-set reactive power level (kVAr).

ACTIVE HEATING

In cold conditions, and when the unit is not working, the inverter can import a small amount of power from the grid to keep the inverter internal ambient temperature above -20°C, without using external resistors.

This autonomous heating system is the most efficient and homogeneous way to prevent condensation, increasing the inverters availability and reducing maintenance. PATENTED

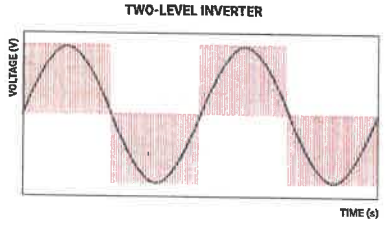
EASY TO MONITOR

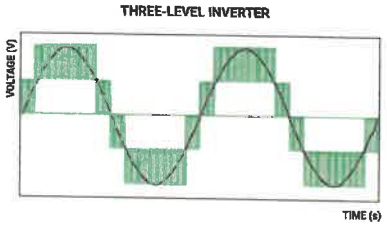
The Freesun app is the easiest way to monitor the status of our inverters. All our inverters come with built-in wifi, allowing remote connectivity to any smart device for detailed updates and information without the need to open cabinet doors. The app user friendly interface allows quick and easy access to critical information (energy registers, production and events).

Available for Apple and Android

MULTILEVEL TOPOLOGY

The multilevel IGBT topology makes the difference when the DC voltage is above 1000V, being the most efficient way to manage high DC link voltages. Based in our long IGBT experience components used in our Solar and Industrial division, the Freemaq PCS takes profit of the three level IGBT topology reducing the power stage losses, increasing the efficiency and offering a very low total harmonic distortion.



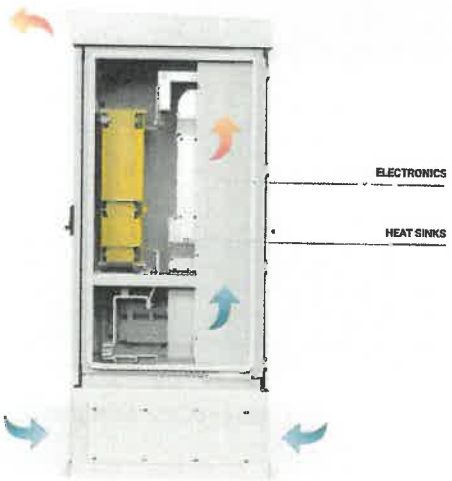


REVOLUTIONARY COOLING SYSTEM

The Power Electronics Freemaq PCS series includes the innovative and sophisticated iCOOL V performance that allows Freemaq PCS to work up to 50°C at nominal power. The cooling system iCOOL V smartly cools the inverter, regulating the cooling system capacity depending on the data from the temperature sensors.

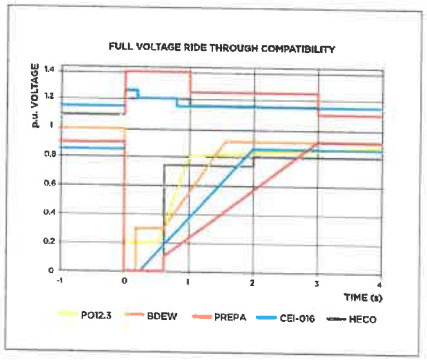
Freemaq PCS modules are divided into two main areas: clean area (electronics) and hot area (heat sink). The electronics are totally sealed and use a temperature control low flow cooling system that reduces filters clogging and maintenance intervals. The hot area integrates a speed controlled fan for each module, simplifying the cooling system and reducing the maintenance tasks.

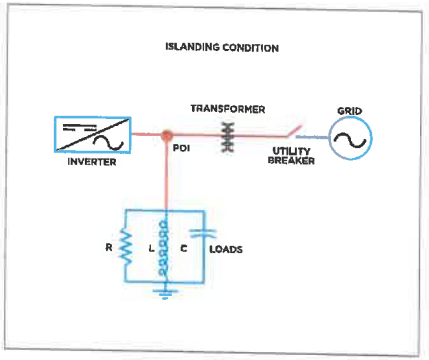
Furthermore, due to the modular topology, the iCOOL V reduces the Stand-by consumption at low capacity to the maximum, boosting the cooling capacity for the installations situated up to 4000 meters above sea level. (patent pending)



DYNAMIC GRID SUPPORT

Freemaq PCS firmware includes the latest utility interactive features (LVRT, OVRT, FRS, FRT, Anti-islanding, active and reactive power curtailment...), and is compatible with all the specific requirements of the utilities.





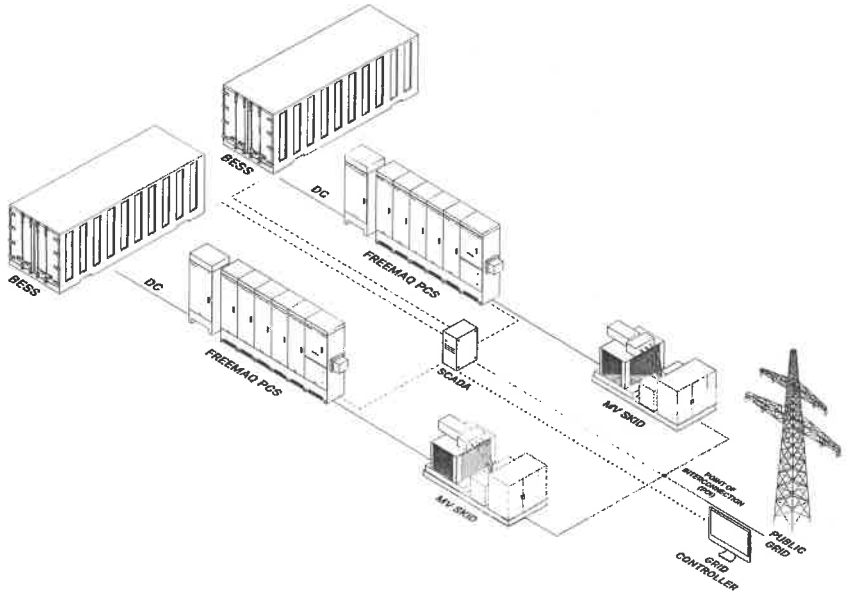
LVRT or ZVRT (Low Voltage Ride Through)
Inverters can withstand any voltage dip or profile required by the local utility. The inverter can immediately feed the fault with full reactive power, as long as the protection limits are not exceeded.

Anti-islanding
This protection combines passive and active methods that eliminates nuisance tripping and reduces grid distortion according to IEC 62116 and IEEE1547.

BATTERY ENERGY STORAGE SYSTEM

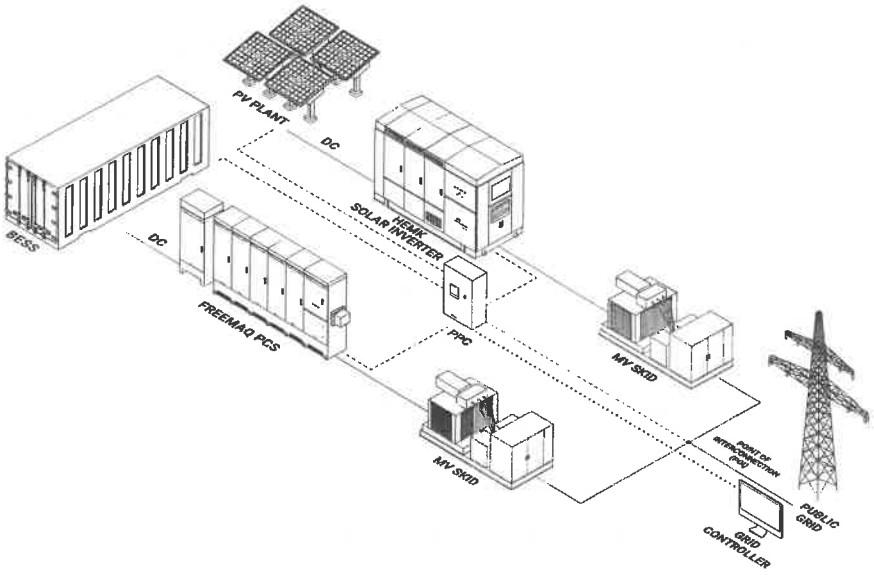
A BESS comprises a battery container connected to a Freemaq PCS (Power Conversion System) that follows the instruction of the main governor of the plant, the PPC (Power Plant Controller) or SCADA.

EXAMPLE 1



Power connections
Plant communications
Grid controller communication

EXAMPLE 2

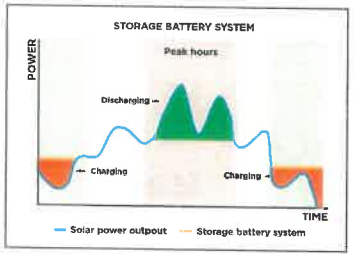


Power connections
Plant communications
Grid controller communication

ENERGY STORAGE APPLICATIONS

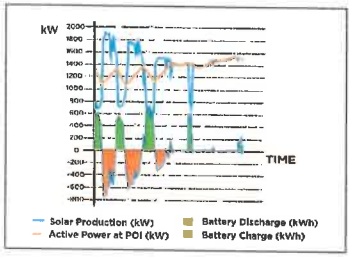
LOAD LEVELING

Freemaq PCS series are able to store energy during periods of low demand from the grid, in order to later supply this energy when there is a higher demand. This has the benefit of selling the energy at a higher market price during peak periods. It also allows grid operators to supply electricity with a higher renewable origin. Since PV generation may not be at the same time as peak demand, this facilitates the flexibility and integration of renewable generation into the grid.



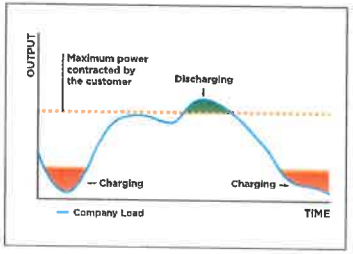
RENEWABLE INTEGRATION

The Freemaq PCS series attenuates the intermittent nature of renewable energy sources, to provide a smoother power output. The Freemaq PCS controls the ramp rate at which power is injected into the grid, and thus reduces the impact of rapid power fluctuations due to sudden or transient conditions experienced by the PV array. The system monitors the PV inverter output to inject or consume power accordingly to ensure the output remains within the ramp requirements.



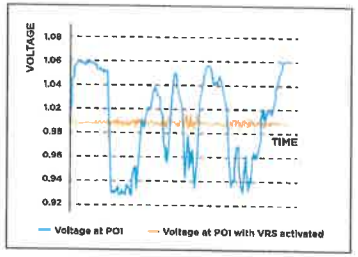
PEAK POWER SHAVING

By delivering stored energy to the grid during periods of high demand, it reduces the burden on the distribution network and increases significantly its efficiency. Energy is stored instead of injected into the grid during periods of low demand, which as a result increases the load on the grid. However, during peak periods this stored energy is then injected into the grid, which reduces the demand at this time. The result is a more flattened demand curve which means the grid can avoid switching on more expensive and polluting generators.



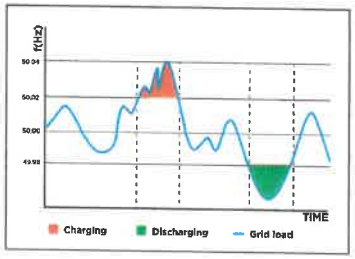
GRID SUPPORT

Freemaq PCS series helps the integration of renewable sources, by helping to maintain grid stability and power quality. It can help support the grid voltage by generating capacitive or inductive current.Other features include Voltage Control, Reactive Power Control and Fault Ride Through Support.



FREQUENCY REGULATION SYSTEM

Freemaq PCS provides ability to regulate grid frequency in both directions. When there is a grid overfrequency (generation>demand) inverter power output is curtailed and this energy is stored. When there is a grid under-frequency (generation<demand) inverter power output is increased by discharging the batteries and injecting more power to the grid.



TECHNICAL CHARACTERISTICS

FREEMAQ PCS 690V

		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCES		FP1290C	FP1720C	FP2150C	FP2580C	FP3000C
AC	AC Output Power (kVA/kW) @50°C[1]	1290	1720	2150	2580	3000
	AC Output Power (kVA/kW) @25°C[1]	1530	2040	2550	3060	3500
	Max. AC Output Current (A) @50°C	1080	1440	1800	2160	2510
	Max. AC Output Current (A) @25°C	1280	1705	2135	2560	2930
	Overload capacity [2]	120% (depending on preload conditions)[3]				
	Operating Grid Voltage (VAC)	690V ±10% [3]				
	Operating Grid Frequency (Hz)	50/60 Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi)[2]	0.0 leading .. 0.0 lagging				
	Reactive power compensation	Four quadrant operation				
DC	DC Voltage Range (full power)	976V-1310V				
	Maximum DC voltage	1500V				
	DC Voltage Ripple	< 3%				
	Max. DC continuous current (A)	1600	2135	2665	3200	3660
	Max. DC shortcircuit current (A)[3]	2320	3100	3880	4650	5450
	Battery Technology	all type of batteries (BMS required)				
	Number of separate DC inputs	1 DC input per inverter[3]				
	Battery Connections	FSDK style battery cabinet with 8 positive and 8 negative connections. Larger FSDK cabinets optional				
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98%				
	Max. Standby Consumption	< approx. 50W/per module				
	Max. Power Consumption (VA) (W)	2400	3200	4000	4800	5600
CABINET	Dimensions [WxDxH] (inches)	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] (mm)	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (lbs)	5809	7253	8697	10141	11585
	Weight (kg)	2635	3290	3945	4600	5255
	Air Flow	Bottom intake. Exhaust top rear vent				
	Type of ventilation	Forced air cooling				
ENVIRONMENT	Degree of protection	NEMA 3R / IP54				
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)				
	Relative Humidity	4% to 100% Condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level[5]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional. Third party SCADA systems supported				
	Keyed ON/OFF switch	Standard				
	Digital I/O	Optional[3]				
	Analog I/O	Optional[3]				
PROTECTIONS	Ground Fault Protection	Insulation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTIFICATIONS	Safety	UL 1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2				
	Utility interconnect	UL 1741SA-Sept. 2016 / IEEE 1547.1-2005				

[1] Values at 1.00·Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCS 645V

		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCES		FP1200C	FP1600C	FP2000C	FP2400C	FP2800C
AC	AC Output Power (kVA/kW) @50°C[1]	1200	1600	2000	2400	2800
	AC Output Power (kVA/kW) @25°C[1]	1430	2040	2550	3060	3500
	Max. AC Output Current (A) @50°C	1075	1430	1790	2150	2505
	Max. AC Output Current (A) @25°C	1280	1710	2140	2560	2995
	Overload capacity [2]	120% (depending on preload conditions)[3]				
	Operating Grid Voltage (VAC)	645V ±10% [3]				
	Operating Grid Frequency (Hz)	50/60 Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi)[2]	0.0 leading .. 0.0 lagging				
	Reactive power compensation	Four quadrant operation				
DC	DC Voltage Range (full power)	913V-1310V				
	Maximum DC voltage	1500V				
	DC Voltage Ripple	< 3%				
	Max. DC continuous current (A)	1600	2135	2665	3200	3660
	Max. DC shortcircuit current (A)[3]	2320	3100	3880	4650	5450
	Battery Technology	all type of batteries (BMS required)				
	Number of separate DC inputs	1 DC input per inverter[3]				
	Battery Connections	FSDK style battery cabinet with 8 positive and 8 negative connections. Larger FSDK cabinets optional				
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98%				
	Max. Standby Consumption	< approx. 50W/per module				
	Max. Power Consumption (VA) (W)	2400	3200	4000	4800	5600
CABINET	Dimensions [WxDxH] (inches)	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] (mm)	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (lbs)	5809	7253	8697	10141	11585
	Weight (kg)	2635	3290	3945	4600	5255
	Air Flow	Bottom intake. Exhaust top rear vent				
	Type of ventilation	Forced air cooling				
ENVIRONMENT	Degree of protection	NEMA 3R / IP54				
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)				
	Relative Humidity	4% to 100% Condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level[5]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional. Third party SCADA systems supported				
	Keyed ON/OFF switch	Standard				
	Digital I/O	Optional[3]				
	Analog I/O	Optional[3]				
PROTECTIONS	Ground Fault Protection	Insulation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTIFICATIONS	Safety	UL 1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2				
	Utility interconnect	UL 1741SA-Sept. 2016 / IEEE 1547.1-2005				

[1] Values at 1.00·Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCS 600V

		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCES		FP1100C	FP1475C	FP1850C	FP2225C	FP2600C
AC	AC Output Power (kVA/kW) @50°C[1]	1100	1475	1850	2225	2600
	AC Output Power (kVA/kW) @25°C[1]	1335	1780	2225	2660	3110
	Max. AC Output Current (A) @50°C	1060	1420	1780	2140	2500
	Max. AC Output Current (A) @25°C	1285	1715	2140	2560	2995
	Overload capacity [2]	120% (depending on preload conditions)[4]				
	Operating Grid Voltage (VAC)	600V ±10% [3]				
	Operating Grid Frequency (Hz)	50/60 Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi)[2]	0.0 leading ... 0.0 lagging				
	Reactive power compensation	Four quadrant operation				
DC	DC Voltage Range (full power)	849V-1310V				
	Maximum DC voltage	1500V				
	DC Voltage Ripple	< 3%				
	Max. DC continuous current (A)	1605	2140	2675	3195	3740
	Max. DC shortcircuit current (A)[3]	2320	3100	3880	4650	5450
	Battery Technology	all type of batteries (BMS required)				
	Number of separate DC inputs	1 DC input per inverter[5]				
	Battery Connections	FSDK style battery cabinet with 8 positive and 8 negative connections. Larger FSDK cabinets optional				
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98%				
	Max. Standby Consumption	< approx. 50W/per module				
	Max. Power Consumption (VA) (W)	2400	3200	4000	4800	5600
CABINET	Dimensions [WxDxH] (inches)	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] (mm)	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (lbs)	5809	7253	8697	10141	11585
	Weight (kg)	2635	3290	3945	4600	5255
	Air Flow	Bottom intake. Exhaust top rear vent				
	Type of ventilation	Forced air cooling				
ENVIRONMENT	Degree of protection	NEMA 3R / IP54				
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)				
	Relative Humidity	4% to 100% Condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [5]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional. Third party SCADA systems supported				
	Keyed ON/OFF switch	Standard				
	Digital I/O	Optional[2]				
	Analog I/O	Optional[2]				
PROTECTIONS	Ground Fault Protection	Insulation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTIFICATIONS	Safety	UL 1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2				
	Utility Interconnect	UL 1741SA-Sept. 2016 / IEEE 1547.1-2005				

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCS 530V

		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCES		FP0990C	FP1320C	FP1650C	FP1980C	FP2310C
AC	AC Output Power (kVA/kW) @50°C[1]	990	1320	1650	1980	2310
	AC Output Power (kVA/kW) @25°C[1]	1180	1575	1970	2360	2755
	Max. AC Output Current (A) @50°C	1080	1440	1795	2155	2515
	Max. AC Output Current (A) @25°C	1285	1715	2145	2570	3000
	Overload capacity [2]	120% (depending on preload conditions)[4]				
	Operating Grid Voltage (VAC)	530V ±10% [3]				
	Operating Grid Frequency (Hz)	50/60 Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi)[2]	0.0 leading ... 0.0 lagging				
	Reactive power compensation	Four quadrant operation				
DC	DC Voltage Range (full power)	750V-1310V				
	Maximum DC voltage	1500V				
	DC Voltage Ripple	< 3%				
	Max. DC continuous current (A)	1605	2145	2680	3210	3750
	Max. DC shortcircuit current (A)[3]	2320	3100	3880	4650	5450
	Battery Technology	all type of batteries (BMS required)				
	Number of separate DC inputs	1 DC input per inverter[5]				
	Battery Connections	FSDK style battery cabinet with 8 positive and 8 negative connections. Larger FSDK cabinets optional				
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98%				
	Max. Standby Consumption	< approx. 50W/per module				
	Max. Power Consumption (VA) (W)	2400	3200	4000	4800	5600
CABINET	Dimensions [WxDxH] (inches)	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] (mm)	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (lbs)	5809	7253	8697	10141	11585
	Weight (kg)	2635	3290	3945	4600	5255
	Air Flow	Bottom intake. Exhaust top rear vent				
	Type of ventilation	Forced air cooling				
ENVIRONMENT	Degree of protection	NEMA 3R / IP54				
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)				
	Relative Humidity	4% to 100% Condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [5]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional. Third party SCADA systems supported				
	Keyed ON/OFF switch	Standard				
	Digital I/O	Optional[2]				
	Analog I/O	Optional[2]				
PROTECTIONS	Ground Fault Protection	Insulation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTIFICATIONS	Safety	UL 1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2				
	Utility Interconnect	UL 1741SA-Sept. 2016 / IEEE 1547.1-2005				

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCS 500V

		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCES		FP0935C	FP1245C	FP1560C	FP1870C	FP2180C
AC	AC Output Power (kVA/kW) @50°C[1]	935	1245	1560	1870	2180
	AC Output Power (kVA/kW) @25°C[1]	1115	1485	1855	2230	2600
	Max. AC Output Current (A) @50°C	1080	1440	1800	2160	2515
	Max. AC Output Current (A) @25°C	1285	1715	2140	2575	3000
	Overload capacity [2]	120% (depending on preload conditions)[4]				
	Operating Grid Voltage (VAC)	500V ±10% [3]				
	Operating Grid Frequency (Hz)	50/60 Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi)[2]	0.0 leading ... 0.0 lagging				
	Reactive power compensation	Four quadrant operation				
DC	DC Voltage Range (full power)	708V-1310V				
	Maximum DC voltage	1500V				
	DC Voltage Ripple	< 3%				
	Max. DC continuous current (A)	1600	2135	2665	3200	3660
	Max. DC shortcircuit current (A)[3]	2320	3100	3880	4650	5450
	Battery Technology	all type of batteries (BMS required)				
	Number of separate DC inputs	1 DC input per inverter[3]				
	Battery Connections	FSDK style battery cabinet with 8 positive and 8 negative connections. Larger FSDK cabinets optional				
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98%				
	Max. Standby Consumption	< approx. 50W/per module				
	Max. Power Consumption (VA) (W)	2400	3200	4000	4800	5600
CABINET	Dimensions [WxDxH] (inches)	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] (mm)	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (lbs)	5809	7253	8697	10141	11585
	Weight (kg)	2635	3290	3945	4600	5255
	Air Flow	Bottom intake. Exhaust top rear vent				
	Type of ventilation	Forced air cooling				
ENVIRONMENT	Degree of protection	NEMA 3R / IP54				
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)				
	Relative Humidity	4% to 100% Condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [5]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional. Third party SCADA systems supported				
	Keyed ON/OFF switch	Standard				
	Digital I/O	Optional[3]				
	Analog I/O	Optional[3]				
PROTECTIONS	Ground Fault Protection	Insulation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTIFICATIONS	Safety	UL 1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2				
	Utility interconnect	UL 1741SA-Sept. 2016 / IEEE 1547.1-2005				

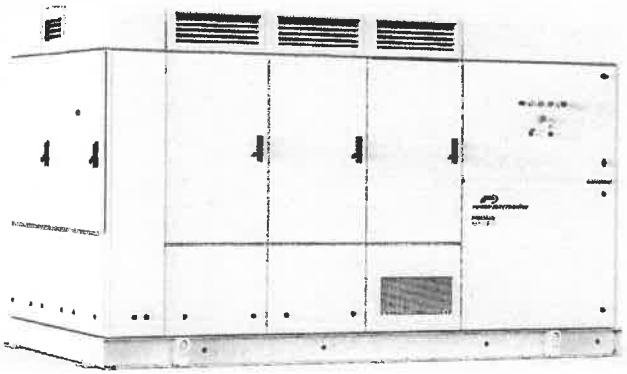
[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ PCS 480V

		FRAME 3	FRAME 4	FRAME 5	FRAME 6	FRAME 7
NUMBER OF MODULES		3	4	5	6	7
REFERENCES		FP0900C	FP1201C	FP1500C	FP1800C	FP2100C
AC	AC Output Power (kVA/kW) @50°C[1]	900	1200	1500	1800	2100
	AC Output Power (kVA/kW) @25°C[1]	1070	1425	1780	2140	2495
	Max. AC Output Current (A) @50°C	1085	1445	1805	2165	2525
	Max. AC Output Current (A) @25°C	1285	1715	2140	2575	3000
	Overload capacity [2]	120% (depending on preload conditions)[4]				
	Operating Grid Voltage (VAC)	480V ±10% [3]				
	Operating Grid Frequency (Hz)	50/60 Hz				
	Current Harmonic Distortion (THDi)	< 3% per IEEE519				
	Power Factor (cosine phi)[2]	0.0 leading ... 0.0 lagging				
	Reactive power compensation	Four quadrant operation				
DC	DC Voltage Range (full power)	679V-1310V				
	Maximum DC voltage	1500V				
	DC Voltage Ripple	< 3%				
	Max. DC continuous current (A)	1600	2135	2665	3200	3660
	Max. DC shortcircuit current (A)[3]	2320	3100	3880	4650	5450
	Battery Technology	all type of batteries (BMS required)				
	Number of separate DC inputs	1 DC input per inverter[3]				
	Battery Connections	FSDK style battery cabinet with 8 positive and 8 negative connections. Larger FSDK cabinets optional				
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98%				
	Max. Standby Consumption	< approx. 50W/per module				
	Max. Power Consumption (VA) (W)	2400	3200	4000	4800	5600
CABINET	Dimensions [WxDxH] (inches)	119.6"x37.2"x86.5"	147.6"x37.2"x86.5"	175.7"x37.2"x86.5"	203.8"x37.2"x86.5"	231.9"x37.2"x86.5"
	Dimensions [WxDxH] (mm)	3038x945x2198	3751x945x2198	4464x945x2198	5177x945x2198	5890x945x2198
	Weight (lbs)	5809	7253	8697	10141	11585
	Weight (kg)	2635	3290	3945	4600	5255
	Air Flow	Bottom intake. Exhaust top rear vent				
	Type of ventilation	Forced air cooling				
ENVIRONMENT	Degree of protection	NEMA 3R / IP54				
	Permissible Ambient Temperature	-35°C[4] to +60°C, >50°C / Active Power derating (>50°C)				
	Relative Humidity	4% to 100% Condensing				
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)				
	Noise level [5]	< 79 dBA				
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display				
	Communication protocol	Modbus TCP				
	Power Plant Controller	Optional. Third party SCADA systems supported				
	Keyed ON/OFF switch	Standard				
	Digital I/O	Optional[3]				
	Analog I/O	Optional[3]				
PROTECTIONS	Ground Fault Protection	Insulation monitoring device				
	Humidity control	Active Heating				
	General AC Protection & Disconn.	Circuit Breaker				
	General DC Protection & Disconn.	External Disconnecting Unit Cabinet				
	Overvoltage Protection	AC and DC protection (type 2)				
CERTIFICATIONS	Safety	UL 1741, CSA 22.2 No.107.1-01, UL62109-1, IEC62109-1, IEC62109-2				
	Utility interconnect	UL 1741SA-Sept. 2016 / IEEE 1547.1-2005				

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.



FREEMAQ MULTI PCS

UTILITY SCALE MULTI PCS INVERTER

- POWER CONVERSION SYSTEM
- FRU — FIELD REPLACEABLE UNITS
- IP65 — IP65 AVAILABLE
- MODULAR DESIGN
- ICOOL 3
- 4Q — 4 QUADRANT
- 3 LEVEL TOPOLOGY

TAKING ADVANTAGE OF THE MOST FLEXIBLE 1500V INVERTER PLATFORM

The Power Electronics Freemaq Multi PCS modular inverter architecture can be designed to support solar generation and energy storage in a single inverter, or even having individual battery systems. Each power module can be designated as either a power module to export PV power or as a bidirectional power module designed to support energy storage.

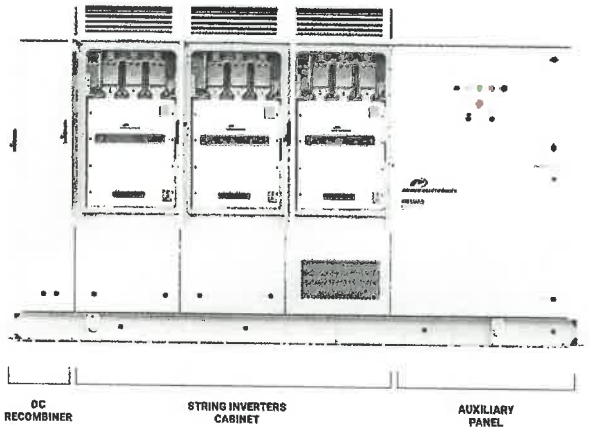
The Freemaq Multi PCS is the perfect solution for having a solar inverter with storage capabilities integrated, such as Peak Shaving, Ramp Rate control, Frequency Regulation and Load Leveling, without the need of an additional transformer.

Within this architecture, the AC bus is designed to match the minimum DC voltage on either the solar or battery system. In the DC side, the inputs for each power module are independent. The Power Electronics Multi PCS Inverter is available with 1 to 6 power modules dedicated to energy storage.

COMPACT DESIGN - EASY TO SERVICE

By providing full front access the Freemaq Multi PCS series simplifies the maintenance tasks, reducing the MTTR (and achieving a lower OPEX). The total access allows a fast swap of the FRUs without the need of qualified technical personnel.

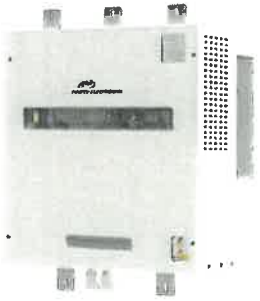
With the Freemaq Multi PCS, Power Electronics offers its most compact solution, achieving 3.8MW in just 12ft long, reducing installation costs and labor time.



STRING CONCEPT POWER STAGES

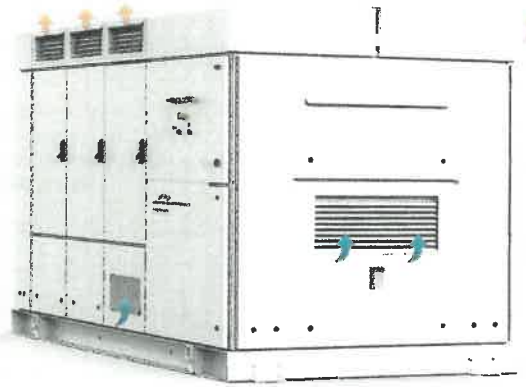
The Freemaq Multi PCS combines the advantages of a central inverter with the modularity of the string inverters. Its power stages are designed to be easily replaceable on the field without the need of advanced technical service personnel, providing a safe, reliable and fast Plug&Play assembly system.

Following the modular philosophy of the Freemaq series, the Multi PCS is composed of 6 FRUs (field replaceable units), being able to work with up to 6 different DC inputs.



INNOVATIVE COOLING SYSTEM

Based on more than 3 years of experience with our MV Variable Speed Drive, the iCOOL3 is the first air-cooling system allowing IP65 degree of protection in an outdoor converter. iCOOL3 delivers a constant stream of clean air to the FRUs, being the most effective way of reaching up to IP65 degree of protection, without having to maintain cumbersome dust filters or having to use liquid-cooling systems, avoiding the commonly known inconveniences of it (complex maintenance, risk of leaks, higher number of components...), therefore resulting in an OPEX cost reduction.



VAR AT NIGHT

At night, the Freemaq Multi PCS inverter can shift to reactive power compensation mode. The inverter can respond to an external dynamic signal, a Power Plant Controller command or pre-set reactive power level (kVAr).

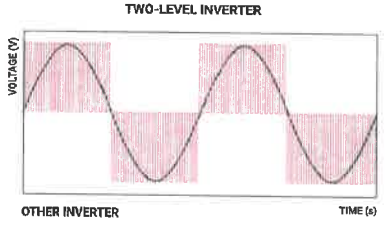
ACTIVE HEATING

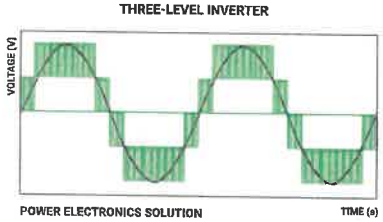
At night, when the unit is not actively exporting power, the inverter can import a small amount of power to keep the inverter internal ambient temperature above -20°C, without using external resistors.

This autonomous heating system is the most efficient and homogeneous way to prevent condensation, increasing the inverters availability and reducing the maintenance. PATENTED

MULTILEVEL TOPOLOGY

The multilevel IGBT topology is the most efficient approach to manage high DC link voltages and makes the difference in the 1,500 Vdc design. Power Electronics has many years of power design in both inverters and MV drives and the Freemaq Multi PCS design is the result of our experience with 3 level topologies. The 3 level IGBT topology reduces stage losses, increases inverter efficiency and minimizes total harmonic distortion.





EASY TO MONITOR

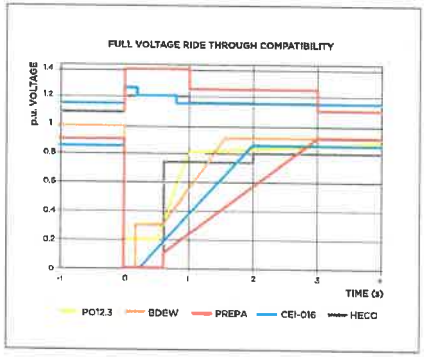
The Freesun app is the easiest way to monitor the status of our inverters. All our inverters come with built-in wifi, allowing remote connectivity to any smart device for detailed updates and information without the need to open cabinet doors.

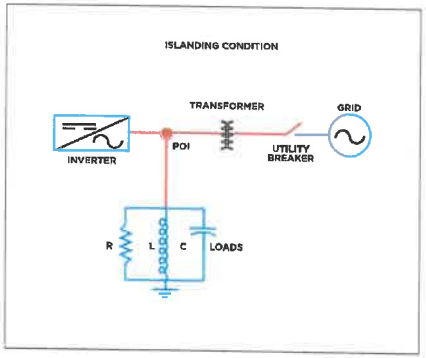
The app user friendly interface allows quick and easy access to critical information (energy registers, production and events).

AVAILABLE INFORMATION	Grid and PV field data. Inverter and Power module data (Voltages, currents, power, temperatures, I/O status...). Weather conditions. Alarms and warnings events. Energy registers. Others.
FEATURES	Easy Wireless connection. Comprehensive interface. Real time data. Save and copy settings.
LANGUAGE	English, Spanish.
SYSTEM REQUIREMENTS	iOS or Android devices.
SETTINGS CONTROL	Yes

DYNAMIC GRID SUPPORT

Freemaq Multi PCS firmware includes the latest utility interactive features (LVRT, OVRT, FRS, FRT, Anti-islanding, active and reactive power curtailment...), and is compatible with all the specific requirements of the utilities.





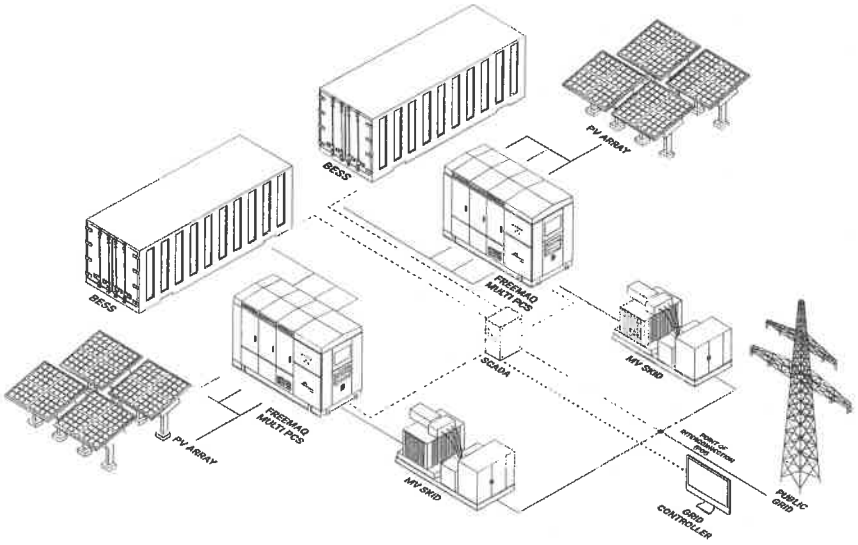
LVRT or ZVRT (Low Voltage Ride Through)
Inverters can withstand any voltage dip or profile required by the local utility. The inverter can immediately feed the fault with full reactive power, as long as the protection limits are not exceeded.

Anti-islanding
This protection combines passive and active methods that eliminates nuisance tripping and reduces grid distortion according to IEC 62116 and IEEE1547.

BATTERY ENERGY STORAGE SYSTEM

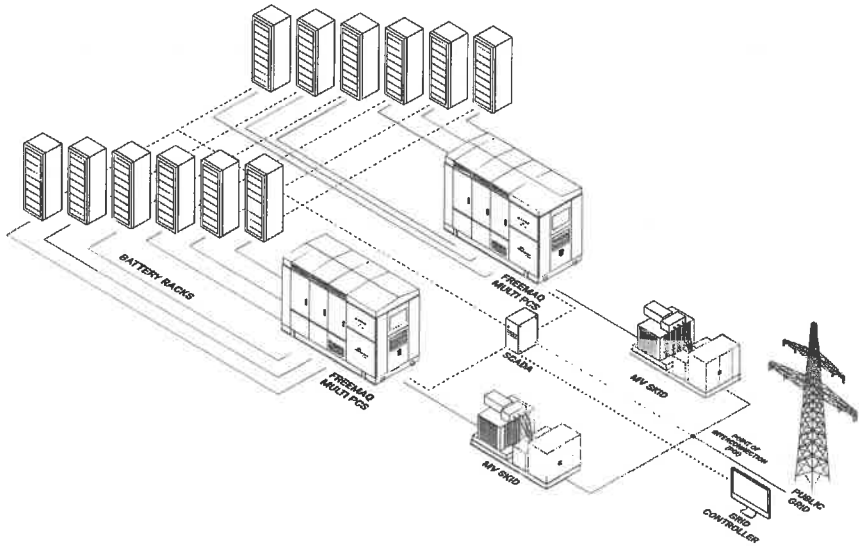
A BESS comprises a battery container connected to a Freemaq Multi PCS (Power Conversion System) that follows the instruction of the main governor of the plant, the PPC (Power Plant Controller) or SCADA.

EXAMPLE 1



Power connections
Plant communications
Grid controller communication

EXAMPLE 2

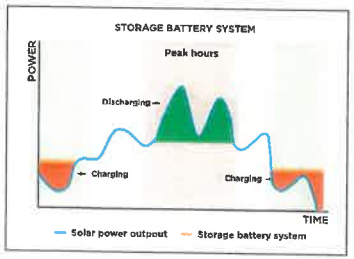


Power connections
Plant communications
Grid controller communication

ENERGY STORAGE APPLICATIONS

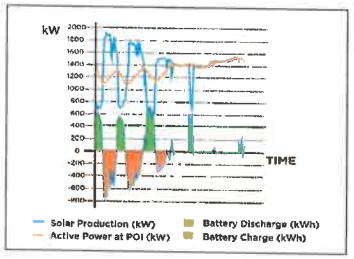
LOAD LEVELING

Freemaq Multi PCS series are able to store energy during periods of low demand from the grid, in order to later supply this energy when there is a higher demand. This has the benefit of selling the energy at a higher market price during peak periods. It also allows grid operators to supply electricity with a higher renewable origin. Since PV generation may not be at the same time as peak demand, this facilitates the flexibility and integration of renewable generation into the grid.



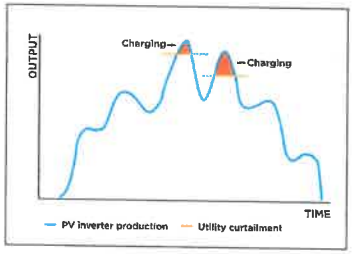
RENEWABLE INTEGRATION

The Freemaq Multi PCS series attenuates the intermittent nature of renewable energy sources, to provide a smoother power output. The Freemaq Multi PCS controls the ramp rate at which power is injected into the grid, and thus reduces the impact of rapid power fluctuations due to sudden or transient conditions experienced by the PV array. The system monitors the PV inverter output to inject or consume power accordingly to ensure the output remains within the ramp requirements.



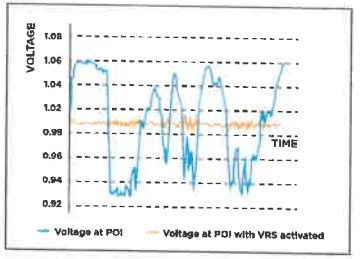
UTILITY CURTAILMENT RECOVERY

Utility scale inverter production can be curtailed by the grid operator, due to the high energy sources penetration in the grid during certain periods. With this AC-coupled energy storage system, the excess energy from the PV field can be stored in the BESS and then delivered when needed.



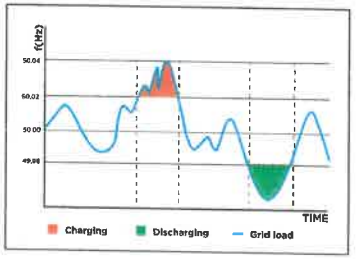
GRID SUPPORT

Freemaq Multi PCS series helps the integration of renewable sources, by helping to maintain grid stability and power quality. It can help support the grid voltage by generating capacitive or inductive current.Other features include Voltage Control, Reactive Power Control and Fault Ride Through Support.



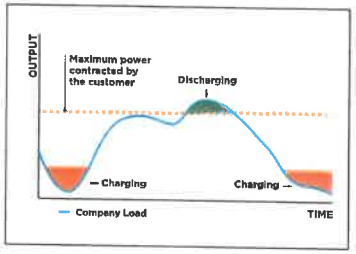
FREQUENCY REGULATION SYSTEM

Freemaq Multi PCS provides ability to regulate grid frequency in both directions. When there is a grid over-frequency (generation>demand) inverter power output is curtailed and this energy is stored. When there is a grid under-frequency (generation<demand) inverter power output is increased by discharging the batteries and injecting more power to the grid.



PEAK POWER SHAVING

By delivering stored energy to the grid during periods of high demand, it reduces the burden on the distribution network and increases significantly its efficiency. Energy is stored instead of injected into the grid during periods of low demand, which as a result increases the load on the grid. However, during peak periods this stored energy is then injected into the grid, which reduces the demand at this time. The result is a more flattened demand curve which means the grid can avoid switching on more expensive and polluting generators.



TECHNICAL CHARACTERISTICS

FREEMAQ MULTI PCS 480V TO 615V

			480V	500V	530V	600V	615V
AC	AC Output Power (kVA/kW) @50°C [1]		1600-2400	1665-2500	1765-2650	2000-3000	2050-3075
	Output Power (kVA/kW) @25°C [1]		1760-2640	1830-2750	1940-2915	2200-3300	2255-3380
	Operating Grid Frequency (Hz)		50/60 Hz				
	Current Harmonic Distortion (THDi)		< 3% per IEEE519				
	Power Factor (cosine phi)[2]		0.0 leading ... 0.0 lagging				
	Reactive power compensation		Four quadrant operation				
DC	DC Voltage Range (Vdc)		679-1310	708-1310	750-1310	849-1310	870-1310
	DC Voltage Ripple		<3%				
	Max. DC continuous current (A)		2645 - 3970 (depending on the PCS configuration)				
	Battery Technology		All type of batteries (BMS required)				
	Number of separate DC inputs		Up to 6 [3]				
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)		98% (preliminary)				
	Max. Standby Consumption		< approx. 50W/per module				
	Max. Power Consumption (VA) (W)		2400 - 5600 (depending on the PCS configuration)				
	External Auxiliary Supply		Optional				
CABINET	Dimensions [WxDxH] (ft/mm)	Frame 1	9 x 7 x 7 / 2.7 x 2.2 x 2.2				
		Frame 2	12 x 7 x 7 / 3.7 x 2.2 x 2.2				
	Weight (lbs/kg)	Frame 1	4900 - 10802,65				
		Frame 2	7000 - 15432,36				
	Air Flow		Bottom intake. Exhaust top vent				
	Type of ventilation		Forced air cooling				
ENVIRONMENT	Degree of protection		IP54 / NEMA3R (i65 Optional)				
	Permissible Ambient Temperature		-35°C[4] to +60°C / >50°C Active Power derating				
	Relative Humidity		0% to 100% Non condensing				
	Max. Altitude (above sea level)		2000m / >2000m power derating (Max. 4000m)				
	Noise level [5]		< 79 dBA				
CONTROL INTERFACE	Interface		Graphic Display (inside cabinet) / Optional Freesun App				
	Communication protocol		Modbus TCP				
	Power Plant Controller		Optional. Third party SCADA systems supported				
	Keyed ON/OFF switch		Standard				
	Digital I/O		Optional[3]				
	Analog I/O		Optional[3]				
PROTECTIONS	Ground Fault Protection		Insulation monitoring device				
	Humidity control		Active Heating				
	General AC Protection & Disconn.		Circuit Breaker				
	General DC Protection & Disconn.		Contactor + Fuses				
	Overvoltage Protection		AC and DC protection (type 2)				

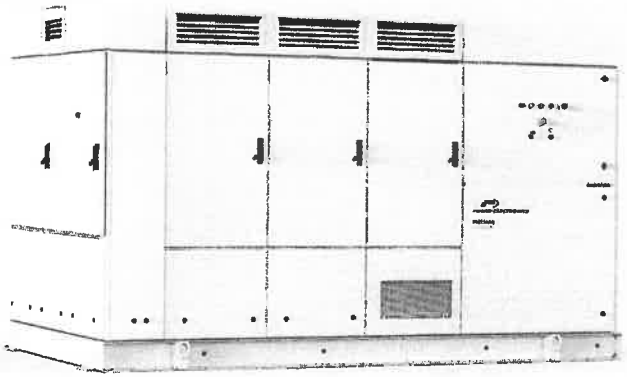
[1] Values at 1,00•Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit.

TECHNICAL CHARACTERISTICS

FREEMAQ MULTI PCS 630V TO 690V

			630V	645V	660V	690V
AC	AC Output Power (kVA/kW) @50°C [1]		2100-3450	2150-3225	2200-3300	2300-3450
	Output Power (kVA/kW) @25°C [1]		2310-3465	2365-3550	2420-3630	2530-3800
	Operating Grid Frequency (Hz)		50/60 Hz			
	Current Harmonic Distortion (THDi)		< 3% per IEEE519			
	Power Factor (cosine phi)[2]		0.0 leading .. 0.0 lagging			
	Reactive power compensation		Four quadrant operation			
DC	DC Voltage Range (Vdc)		891-1310	913-1310	934-1310	976-1310
	DC Voltage Ripple		<3%			
	Max. DC continuous current (A)		2645 - 3970 (depending on the PCS configuration)			
	Battery Technology		All type of batteries (BMS required)			
	Number of separate DC inputs		Up to 6 [3]			
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)		98% (preliminary)			
	Max. Standby Consumption		< approx. 50W/per module			
	Max. Power Consumption (VA) (W)		2400 - 5600 (depending on the PCS configuration)			
	External Auxiliary Supply		Optional			
CABINET	Dimensions [WxDxH] (ft/mm)	Frame 1	9 x 7 x 7 / 2.7 x 2.2 x 2.2			
		Frame 2	12 x 7 x 7 / 3.7 x 2.2 x 2.2			
	Weight (lbs/kg)	Frame 1	4900 - 10802,65			
		Frame 2	7000 - 15432,36			
	Air Flow		Bottom intake. Exhaust top vent			
	Type of ventilation		Forced air cooling			
ENVIRONMENT	Degree of protection		IP54 / NEMA3R (i65 Optional)			
	Permissible Ambient Temperature		-35°C[4] to +60°C / >50°C Active Power derating			
	Relative Humidity		0% to 100% Non condensing			
	Max. Altitude (above sea level)		2000m / >2000m power derating (Max. 4000m)			
	Noise level [5]		< 79 dBA			
CONTROL INTERFACE	Interface		Graphic Display (inside cabinet) / Optional Freesun App			
	Communication protocol		Modbus TCP			
	Power Plant Controller		Optional. Third party SCADA systems supported			
	Keyed ON/OFF switch		Standard			
	Digital I/O		Optional[3]			
	Analog I/O		Optional[3]			
PROTECTIONS	Ground Fault Protection		Insulation monitoring device			
	Humidity control		Active Heating			
	General AC Protection & Disconn.		Circuit Breaker			
	General DC Protection & Disconn.		Contactor + Fuses			
	Overvoltage Protection		AC and DC protection (type 2)			

[1] Values at 1,00•Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.
[2] Consult P-Q charts available: Q(kVAr)=√(S(kVA)²-P(kW)²).
[3] Consult Power Electronics for other configurations.
[4] Heating resistors kit option below -20°C.
[5] Readings taken 1 meter from the back of the unit



FREEMAQ STATCOM

UTILITY SCALE STATIC COMPENSATOR

- FRU — FIELD REPLACEABLE UNITS
- MODULAR DESIGN
- ICOOL 3
- 3 LEVEL TOPOLOGY
- IP65 — IP65 AVAILABLE

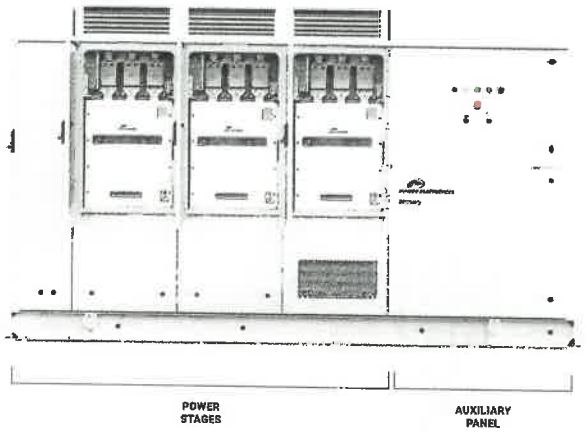
TAKING ADVANTAGE OF THE MOST FLEXIBLE 1500V INVERTER PLATFORM

Freemaq STATCOM is a high power, utility scale, modular static compensator. It is ideal for dynamic reactive response, VAR support and grid voltage stabilization in either industrial locations or distributed generators such as renewable energy plants. Its modular design and redundant topology make it the perfect solution for the most demanding installations. As an outdoor solution, it doesn't need to be installed in a technical room and neither does it need additional cooling thanks to its revolutionary iCOOL 3 system. It is available in 2 different frames ranging from 2300 kVAr to 3800 kVAr.

COMPACT DESIGN - EASY TO SERVICE

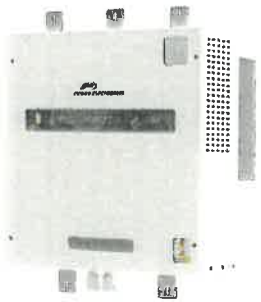
By providing full front access the Freemaq Statcom series simplifies the maintenance tasks, reducing the MTTR (and achieving a lower OPEX). The total access allows a fast swap of the FRUs without the need of qualified technical personnel.

With the Freemaq Statcom, Power Electronics offers its most compact solution, achieving 3.8MW in just 12ft long, reducing installation costs and labor time.



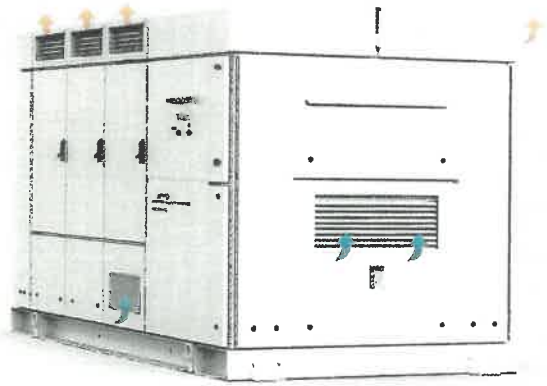
STRING CONCEPT POWER STAGES

The Freemaq Statcom combines the advantages of a central inverter with the modularity of the string inverters. Its power stages are designed to be easily replaceable on the field without the need of advanced technical service personnel, providing a safe, reliable and fast Plug&Play assembly system.



INNOVATIVE COOLING SYSTEM

Based on more than 3 years of experience with our MV Variable Speed Drive, the iCOOL3 is the first air-cooling system allowing IP65 degree of protection in an outdoor converter. iCOOL3 delivers a constant stream of clean air to the FRUs, being the most effective way of reaching up to IP65 degree of protection, without having to maintain cumbersome dust filters or having to use liquid-cooling systems, avoiding the commonly known inconveniences of it (complex maintenance, risk of leaks, higher number of components...), therefore resulting in an OPEX cost reduction.



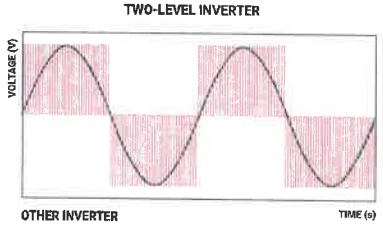
ACTIVE HEATING

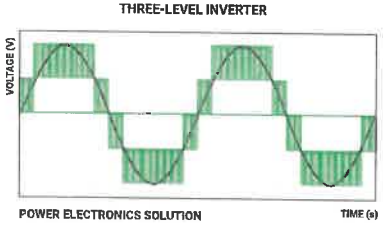
When the unit is not actively exporting power, the inverter can import a small amount of power to keep the inverter internal ambient temperature above -20°C, without using external resistors.

This autonomous heating system is the most efficient and homogeneous way to prevent condensation, increasing the inverters availability and reducing the maintenance. PATENTED

MULTILEVEL TOPOLOGY

The multilevel IGBT topology is the most efficient approach to manage high DC link voltages and makes the difference in the 1,500 Vdc design. Power Electronics has many years of power design in both inverters and MV drives and the Freemaq Statcom design is the result of our experience with 3 level topologies. The 3 level IGBT topology reduces stage losses, increases inverter efficiency and minimizes total harmonic distortion.

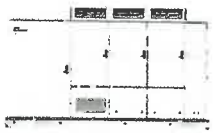




EASY TO MONITOR

The Freesun app is the easiest way to monitor the status of our inverters. All our inverters come with built-in wifi, allowing remote connectivity to any smart device for detailed updates and information without the need to open cabinet doors.

The app user friendly interface allows quick and easy access to critical information (energy registers, production and events).



AVAILABLE INFORMATION	Grid and PV field data. Inverter and Power module data (Voltages, currents, power, temperatures, I/O status...). Weather conditions. Alarms and warnings events. Energy registers. Others.
FEATURES	Easy Wireless connection. Comprehensive interface. Real time data. Save and copy settings.
LANGUAGE	English, Spanish.
SYSTEM REQUIREMENTS	iOS or Android devices.
SETTINGS CONTROL	Yes

TECHNICAL CHARACTERISTICS

FREEMAQ STATCOM 690V

		FRAME 1	FRAME 2
NUMBER OF MODULES		4	6
REFERENCES		FT2300	FT3450
AC	AC Output Power (kVA/kW) @50°C [1]	2300	3450
	Max. AC Output Current (A)@50°C	1925	2887
	Operating Grid Voltage (VAC)	690V ±10% [1]	
	Operating Grid Frequency (Hz)	50/60 Hz	
	Current Harmonic Distortion (THDi)	< 3% per IEEE519	
EFFICIENCY & AUX. SUPPLY	Efficiency (Max) (η)	98.8%	
	Max. Standby Consumption	< approx. 50W/per module	
CABINET	Dimensions [WxDxH] (ft)	9 x 7 x 7	12 x 7 x 7
	Dimensions [WxDxH] (m)	2.7 x 2.2 x 2.2	3.7 x 2.2 x 2.2
	Weight (lbs)	10802,65	15432,36
	Weight (kg)	4900	7000
	Type of ventilation	Forced air cooling	
ENVIROMENT	Degree of protection	NEMA 3R / IP54 / (IP65 Optional)	
	Permissible Ambient Temperature	-35°C[2] to +60°C, >50°C / Active Power derating (>50°C)	
	Relative Humidity	4% to 100% Condensing	
	Max. Altitude (above sea level)	2000m / >2000m power derating (Max. 4000m)	
	Noise level [3]	< 79 dBA	
CONTROL INTERFACE	Interface	Graphic Display (inside cabinet) / Optional Freesun App display	
	Communication protocol	Modbus TCP	
	Power Plant Controller	Optional. Third party SCADA systems supported	
	Keyed ON/OFF switch	Standard	
	Digital I/O	Optional	
	Analog I/O	Optional	
PROTECTIONS	Ground Fault Protection	Insulation monitoring device	
	Humidity control	Active Heating	
	General AC Protection & Disconn.	Circuit Breaker	
	Overvoltage Protection	Type 2	

[1] Values at 1.00-Vac nom and cos Φ= 1.
Consult Power Electronics for derating curves.

[2] Heating kit option required below -20°C.
[3] Sound pressure level at a distance of 1m from the rear part.

POWER PLANT CONTROLLER

POWER PLANT CONTROLLER

- LOAD LEVELING
- RENEWABLE INTEGRATION
- UTILITY CURTAILMENT RECOVERY
- CLIPPING RECOVERY
- FREQUENCY REGULATION SYSTEM
- PEAK POWER SHAVING

ENHANCE THE DYNAMIC GRID SUPPORT OF YOUR PV PLANT

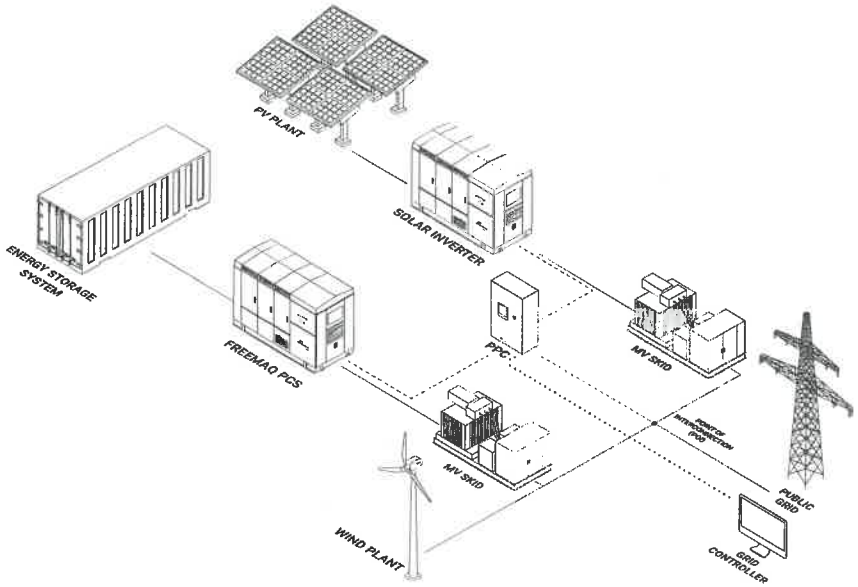
Power Electronics experience in integrating its products into different global electrical networks enables us to offer a set of solutions that can be customized to your requirements to control different sources of energy into the same grid.

The integration of an alternative power source creates an unprecedented opportunity to reduce operational costs to off grid industrial and commercial facilities.

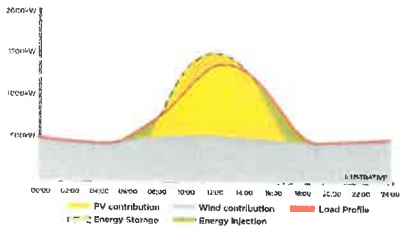
POWER PLANT CONTROLLER

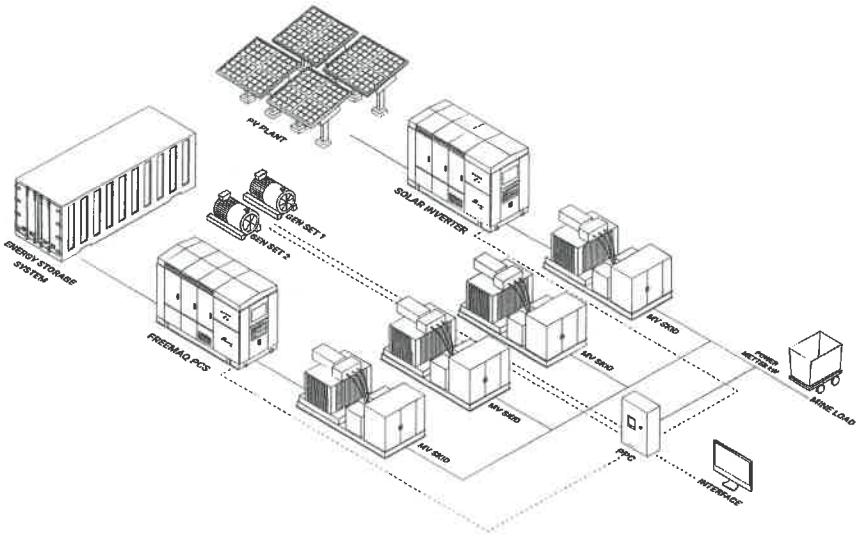
The Power Plant Controller (PPC) can be the main governor of the most complex Multi PCS systems by monitoring the point of interconnection (POI) and at the same time controlling the power generation and storage equipment.

The PPC is equipped with the latest PLC based microprocessor that interacts through the programmable digital/ analogue signals and communication ports (Modbus TCP). The PPC together with the Freesun solar inverter or the Freemaq series can be customized for those countries (Puerto Rico, Hawaii....) that require full compliance to stringent dynamic grid support response at POI.

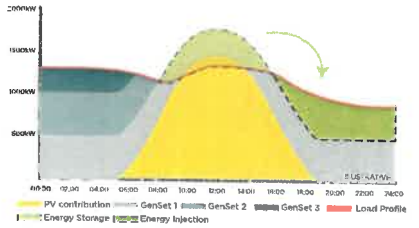


- PPC main governor and interface of the system.
- Multiple renewable power sources: solar, wind, etc.
- Centralized dynamic grid support at POI.
- Power smoothing – Enable ramp rate control.
- Storage equipment control.





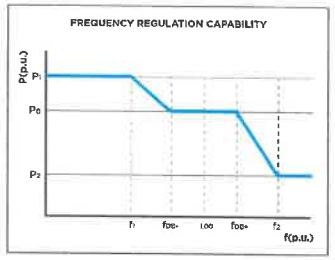
- PPC main governor and interface of the system.
- Multiple GenSets and storage equipment control.
- Centralized dynamic grid support at POI.
- Power shaping - Enhanced broad implementation of decentralized PV.
- Power smoothing – Enable ramp rate control.

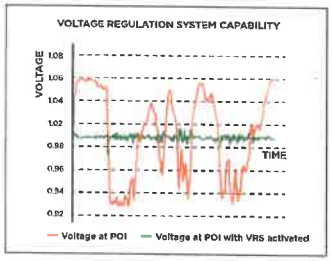


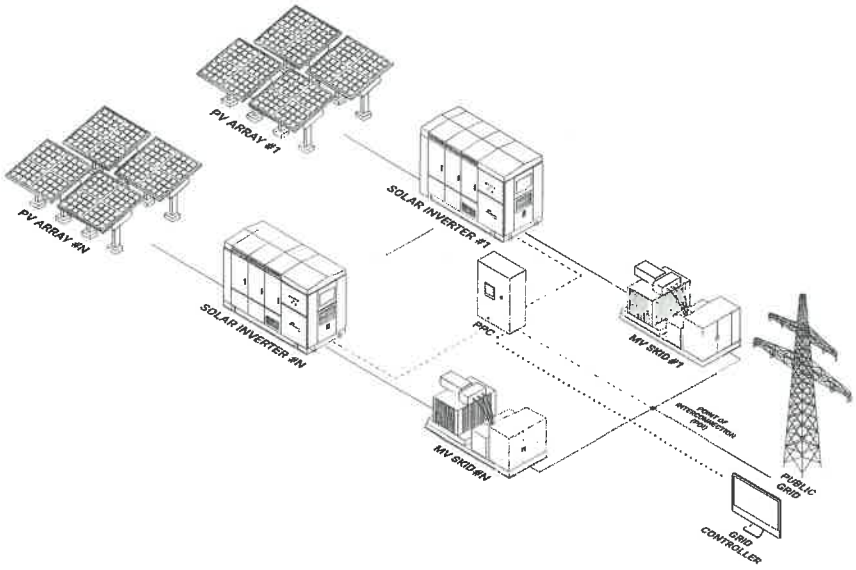
DYNAMIC GRID SUPPORT

The Power Electronics Power Plant Controller is a device used to manage PV plants in order to comply with all the utility and customer requirements, thanks to its fast and flexible control algorithms. The PPC helps the grid controller to manage the performance of the PV plant, guaranteeing grid quality requirements.

The PPC includes the latest utility interactive specifications to support the grid, by controlling the reactive and active power at the POI with a fast response time. This flexible plant control device allows the user to customize the unit, in order to comply with any grid code standards and regulations.







TECHNICAL CHARACTERISTICS

PPC

GENERAL DATA	Dimensions (WxDxH) mm	415 x 230 x 515
	Weight (kg)	10
	Mounting system	Wall mounted
	Compatible inverters	HE, HEC, HEM, HEMK and Freemaq PCS
	Power Supply	250W
I/O and COMMUNICATIONS[1]	4 x Digital Inputs	Programmable inputs and active high (24Vdc). Optically isolated.
	1 x RS485 Port	3 wires (GND,A,B), Modbus RTU
	1 x USB Port	PC connectable using a master.Modbus configurator (ModScan or similar). Reserved for TS.
	1 x CAN Port	3 wires (LO, GND, HI), Modbus RTU
	1 x Ethernet Port (RJ45)	Modbus TCP/IP
ENVIRONMENTAL CONDITIONS	Operation Temperature	0~50°C (32°~122°F)
	Storage temperature	-20~80°C (-4°~176°F)
	Humidity	5-95% non-condensing
	Degree of protection	IP42
CERTIFICATIONS	CE	
OTHERS	Web interface for local and remote monitoring	
	Customized solution	

[1] Communication ports can be customised depending on PV plant design without prior notice.

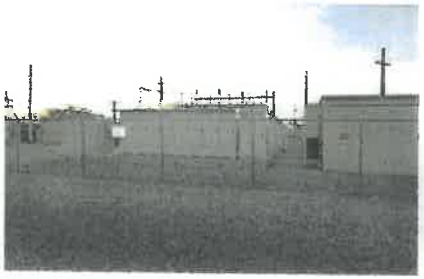
REFERENCES

More than 12GW installed around the world.

AUSTRALIA

Ballarat, 30MW

FREEMAQ PCS



UNITED STATES

Pima, 11MW

FREEMAQ PCS

UNITED STATES

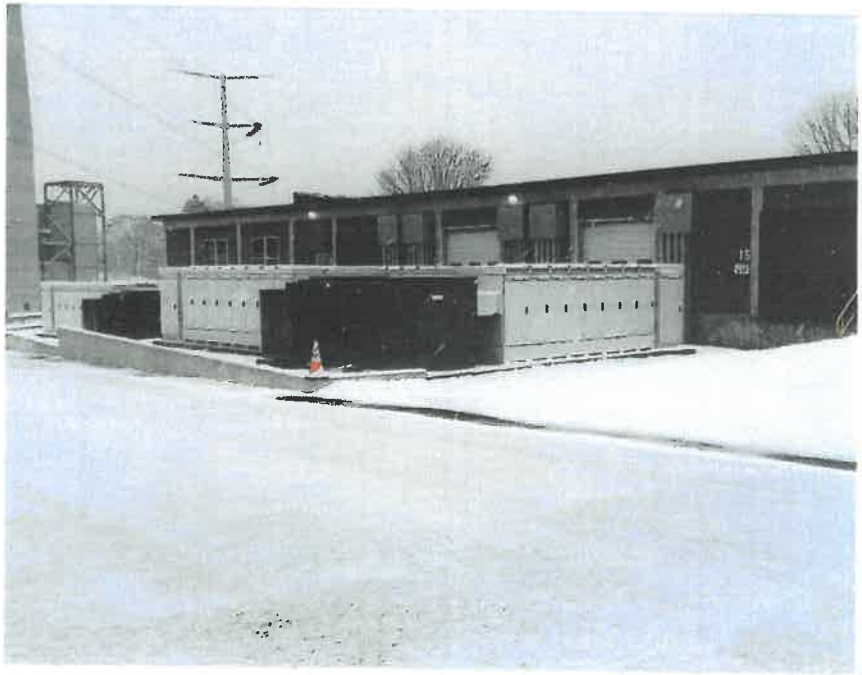
Citrus, 2MW

FREEMAQ DC/DC

UNITED STATES

Vista, 43.2MW

FREEMAQ PCS



UNITED STATES

Casco Bay, 18MW

FREEMAQ PCS

WARRANTY

Power Electronics (The Seller) warrants that their Energy Storage And Power Quality Products are free of faults and defects for a period of 3 years, valid from the date of delivery to the Buyer. It shall be understood that a product is free of faults and defects when its condition and performance is in compliance with its specification.

The warranty shall not extend to any Products whose defects are due to (i) careless or improper use, (ii) failure to observe the Seller's instructions regarding the transport, installation, functioning, maintenance and the storage of the Products, (iii) repairs or modifications made by the Buyer or third party without prior written authorization of the Seller, (iv) negligence during the implementation of authorized repairs or modifications, (v) if serial numbers are modified or illegible, (vi) anomalies caused by, or connected to, the elements coupled directly by the Buyer or by the final customer, (vii) accidents or events that place the Product outside its storage and operational specification, viii) continued use of the Products after identification of a fault or defect.

The warranty excludes components that must be replaced periodically such as fuses, lamps & air filters or consumable materials subject to normal wear and tear. The warranty excludes external parts that are not manufactured by the Seller under the brand of Power Electronics.

The Seller undertakes to replace or to repair, himself, at their discretion, any Product or its part that demonstrates a fault or defect, which is in conformance with the aforementioned terms of the warranty. Reasonable costs associated with the disassembly/assembly, transport and customs of equipment will also be undertaken by the Seller except in cases of approved intervention by the Buyer and/or their representative where cost allocation has been previously agreed.

In case of fault or defect, the Buyer shall notify the Seller in writing by using the following contact email: quality@power-electronics.com, of the presence of any fault or defect within 15 days of the fault or defect event. The serial number of the defective product plus a brief description of the fault must be included in the email. Failure to notify the Seller of fault or defect within this time period may result in the warranty becoming invalid.

In the event of replacement of defective Product or part thereof, the property of the Product or part shall be transferred to the Seller.

The Seller shall bear no liability for damages to property or third persons, even as manufacturer of the Products, other than that expressly provided by virtue of applicable mandatory law provisions. In any case, the Seller shall not be liable for indirect or consequential damages of whatsoever nature as, by way of example, production losses or unearned profits.

The Seller shall, at their discretion, forfeit all warranty rights of the Buyer if the total sum of the contract and payment has not been reached in accordance with the agreed conditions of the contract.

No other warranties, express or implied, are made with respect to the Products including, but not limited to, any implied warranty of merchantability or fitness for a particular purpose.

In any case, the Buyer's right to damages shall be limited to a maximum amount equal to no more than the price obtained by the Seller of the faulty or defective Products.

These conditions shall apply to any repaired or replacement products. Not withstanding the above, the replacement of a Product does not imply an extension of the term of warranty outside that of the original term.

ADDITIONAL WARRANTY

Power Electronics stands by the quality and durability of our inverters. That is why we offer a comprehensive 3 year warranty on our equipment. As the inverter is the critical component of the installation, it must not shutdown.

This is why we have made it our top priority to create a robust and reliable product and give the best service and warranty along with it. To boost your confidence further in our products, Extended Warranty packages up to 20 years are also available.

HEADQUARTERS

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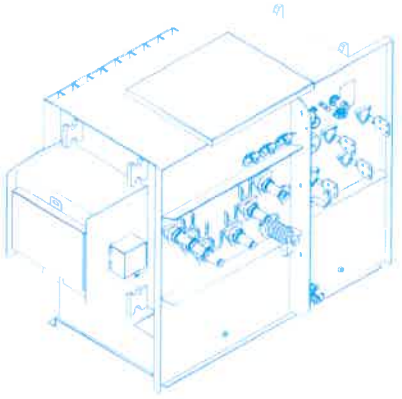
Tel. (+1) 602-354-4890

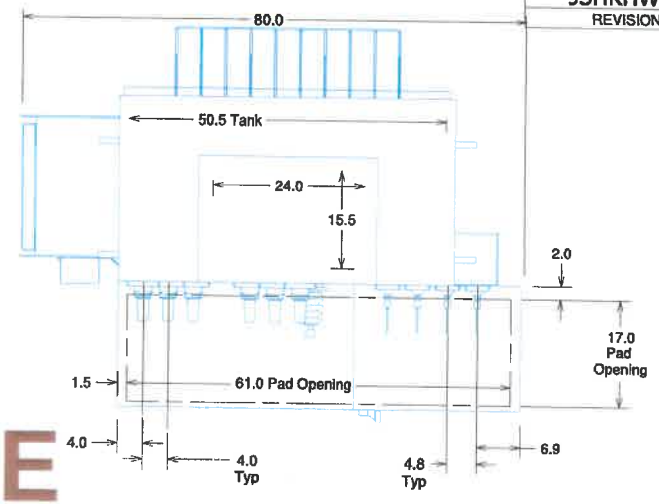
POWER ELECTRONICS®

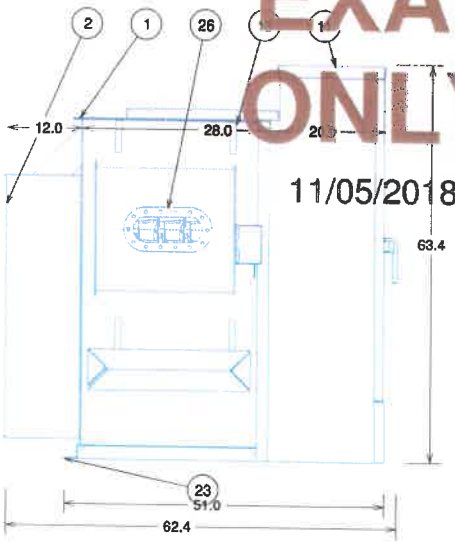
POWER-ELECTRONICS.COM

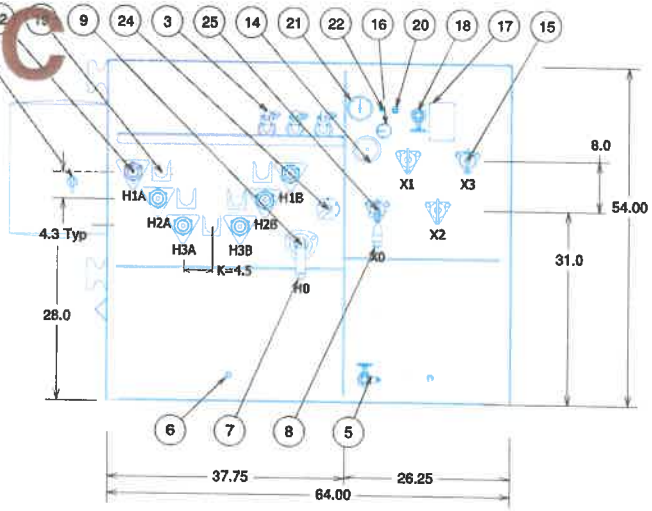
ITE	DESCRIPTION
1	Welded Cover w/ Handhole
2	Cooling Corrugate
3	Cooper Bayonet Fusing w/ Dripshield
4	Current Limiting Backup Fuses (Internal)
5	Drain Valve with Sampler
6	Ground Nut .50-13 Tap
7	Ground Strap and Nut
8	Ground Strap and Nut
9	H0 Bushing
10	10.0kV (8.4kV MCOV) Elbow Arrester (boxed)
11	High Security Cabinet w/ Pentahead Door Bolts
12	35kV 200 Amp HV Bushing Well w/ 15kV Insert
13	Lifting Lug
14	Liquid Temperature Gauge
15	1.2kV LV Bushing w/4 Hole Spade
16	Magnetic Oil Level Gauge
17	Nameplate
18	One Inch Upper Fill Valve
19	Parking Stand
20	Pressure Relief Valve
21	Pressure Vacuum Gauge
22	Schrader Valve
23	Tank Base w/ Jacking and Rolling Facilities
24	5-Position Tap Changer
25	X0 Bushing
26	External Visible Loadbreak Window
27	Two Position Loadbreak Switch w/ Padlockable Cover

Cabinet Removed









3PH Padmount Transformer 60Hz
375.0 kVA KNAN 65 AWR FR3
HV 13200Y/7620 95 kV BIL
LV 600Y/347 30 kV BIL
5.73 %IZ
Approximate Weight 5396 lbs.
Munsell Green Topcoat
Mild Steel Construction

JSHKHWMD
REVISIONS

MATERIAL:

ALL DIMENSIONS ARE IN INCHES [MM]

THIS DRAWING HAS BEEN GENERATED FROM A 3D MODEL.

EATON
Powering Business Worldwide

TITLE: Distribution Transformer Outline Drawing

DESC: COOPER POWER SERIES THREE-PHASE PAD-MOUNTED COMPARTMENTAL TYPE

DWG:	DATE:	REF:	SHEET #:	SCALE:	REV:
PTP	10/2/2018	P3D V03R09M05	1 OF 1		00

JSHKHWMD

Copy of Fee Checks

ANDREWS SURVEY & ENGINEERING, INC.
104 MENDON STREET, P.O. BOX 312
UXBRIDGE, MA 01569

UNIBANK FOR SAVINGS
UXBRIDGE, MA 01569
53-7237/2113

38969

11/19/2018

PAY TO THE ORDER OF Franklin, Town of $ **750.00

Seven Hundred Fifty and 00/100********** DOLLARS

PROTECTED AGAINST FRAUD

Town of Franklin

MEMO

⑈038969⑈ ⑆211372378⑆ 88 900 20 10⑈

CASH ONLY IF ALL CheckLock™ SECURITY FEATURES LISTED ON BACK INDICATE NO TAMPERING OR COPYING

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UXBRIDGE, MA 01569

UNIBANK FOR SAVINGS
UXBRIDGE, MA 01569
53-7237/2113

38970

11/19/2018

PAY TO THE ORDER OF Franklin, Town of $ **1,500.00

One Thousand Five Hundred and 00/100********** DOLLARS

PROTECTED AGAINST FRAUD

Town of Franklin

MEMO

⑈038970⑈ ⑆211372378⑆ 88 900 20 10⑈

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53-7237/2113

38971

11/19/2018

PAY TO THE ORDER OF Franklin, Town of $ **50.00

Fifty and 00/100********** DOLLARS

PROTECTED AGAINST FRAUD

Town of Franklin

MEMO

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