

**APPLICATION FOR
SPECIAL PERMIT AND SITE PLAN
REVIEW**

for

**5 & 5R HATFIELD STREET
WILLIAMSBURG, MASSACHUSETTS**

Prepared for:

ZPT Energy Solutions II, LLC
6 Park Avenue, Suite 100, Lower Level
Worcester, Massachusetts 01605

Prepared by:

Meridian Associates, Inc.
500 Cummings Center, Suite 5950
Beverly, Massachusetts 01915
(978) 299-0447

February 19, 2019





VIA: HAND DELIVERY

February 19, 2019

Town Clerk
Town of Williamsburg
141 Main Street
PO Box 447
Williamsburg, Massachusetts 01039

**Re: Application of Special Permit and Site Plan Review
Large-Scale Ground-Mounted Solar Photovoltaic Facilities
5 & 5R Hatfield Street
Williamsburg, Massachusetts**

Dear Sir/Madam,

On behalf of ZPT Energy Solutions II, LLC (Applicant), Meridian Associates, Inc. (MAI) is submitting Special Permit and Site Plan Review Applications to the Town of Williamsburg Planning Board and Zoning Board of Appeals. These applications are being submitted in accordance with Section 5 (Special Permits) of the Town's Zoning Bylaw, as well as Section 6 (Site Plan Review). This submittal has also been prepared in accordance with Section 9.30 (Ground-mounted Solar Photovoltaic Installation Requirements). The locus properties (site) is located within the Rural (RU) District. The parcels are identified as Map G Parcel 76-1 and Map K, Parcel 33.

The applicant is proposing to install a Large-Scale Ground-Mounted Solar Photovoltaic Facility (SPF), a total of 14,924 modules (4.75± Megawatt (DC)), comprised of a single array within an undeveloped portion of the parcel totaling 93.5± acres, 14.1± acres of which is the SPF.

The applicant has signed a development agreement with the property owner, Penelope Johnson, to develop the SPF on the parcel. The array is located within an area of undeveloped, wooded land that has had small areas cleared from logging operations and will have limited to no visibility from neighbor's view.

The solar panels will be installed using a racking system elevated above the ground utilizing posts. This installation method limits the need to regrade large areas within the proposed array, minimizing earth moving. Access to and from the array shall consist of a proposed 18-foot wide gravel access drive, a crossing over the existing perennial stream comprised of precast box culverts and concrete block walls, and an associated 20-foot wide gravel turnaround area for larger vehicles such as fire apparatus. The gravel driveway shall be attached to the gravel driveway on the property of Larry West, which has been previously permitted by the Town. These shall serve as access to the systems for scheduled maintenance and emergency access. The



SPF will also include, but not be limited to, the installation of inverter/transformer stations on concrete pads, battery energy storage system, underground conduit, fencing, gates, and associated seeding and stabilization.

The proposed activities within the locus area will not result in an increase in stormwater runoff. Straw bales, Silt fencing, Filtermitt erosion control barriers or equivalent have been proposed to ensure sedimentation control. Following the installation of the SPF, the area within the array and all disturbed areas shall be seeded with a mix “New England Conservation/Wildlife mix” and New England Erosion Control mix” seed mixes. These seed mixes contains a variety of low-growing, low-maintenance fescues that will stabilize the ground surface as well as flowering species to provide wildlife and pollinator habitat. The surrounding chain link fence for the SPF will have a 6-inch between the fence bottom and the ground to allow small animal travel throughout the project site.

In support of this filing we are providing the following information:

- One (1) original and thirteen (13) full size copies of the “ZPTII-241 Solar Array 95 Main Street” (set of 13 sheets) dated February 19, 2019.
- Four (4) copies of the “Stormwater Analysis & Calculations for 5 & 5R Hatfield Street” dated February 19, 2019;
- Fourteen (14) copies of this Cover Letter dated February 19, 2019;
- Fourteen (14) copies of the “Applications for Special Permit & Site Plan Review” Package dated February 19, 2019;
- Two electronic disks containing PDF’s of the above items.

Thank you for your attention to this Application. Please do not hesitate to contact us if you have any questions or require additional information.

Sincerely,

MERIDIAN ASSOCIATES, INC.

Chris Ryan, EIT
Project Manager

P:\6091_ZPII-Haydenville\ADMIN\Reports\Site Plan Review and Special Permit\00.0A [6091] Cover Letter.doc

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**OWNER AFFIDAVIT AUTHORIZATION
LETTER**



February 11, 2019

Williamsburg Zoning Board of Appeals & Planning Board
141 Main Street
PO Box 447
Haydenville, Massachusetts 01039

**Re: 5 Hatfield Road Solar Development
5 & 5R Hatfield Road
Williamsburg, Massachusetts**

Dear Zoning Board of Appeals and Planning Board Members,

As the land owner of record for the properties located at 5 & 5R Hatfield Road, as referenced in the accompanying Engineering plans and further defined as Lot 33 on Assessors Map K and Lot 76-1 on Assessors Map G, I hereby authorize ZPT Energy Solutions II, LLC to apply for a Special Permit and Site Plan Review for the installation of a Solar Energy Generating Facility on this property.

Sincerely,

Penelope Johnson
5 Hatfield Road
Williamsburg, Massachusetts 01096

**COPY OF SPECIAL PERMIT AND SITE PLAN
REVIEW APPLICATIONS**

The Commonwealth of Massachusetts
TOWN OF WILLIAMSBURG

Office of the
Planning Board
APPLICATION FOR SITE PLAN REVIEW


Non-residential, non-agricultural structure or structures, which have an aggregate footprint
exceeding five thousand (5000) square feet. (Section 6.0)
And not in excess of ten thousand (10,000) square feet (section 4.3)

To the Town Clerk
Williamsburg, Massachusetts:

Pursuant to the provisions the Protective Bylaw of the Town of Williamsburg, application is hereby
made to the Planning Board for Site Plan Review

On premises located at 5 & 5R Hatfield Street Map G, Parcel 76-1, Map K, Parcel 33
Street and number assessor's map and parcel number

Owned by Penelope Johnson, 5 Hatfield Street, Haydenville, MA 01039 BK 3482, PG 290 & BK 3690, PG 313
Name address deed recorded Book - Page

Applicant  Phone (508) 713-2793
Signature Adam Christie, Vice President

Applicant ZPT Energy Solutions II, LLC address 6 Park Avenue, Suite 100, Lower Level, Worcester, MA 01605
Please print name street town zip

Please include the attached check list of application elements as part of the application.

*****ADMINISTRATIVE USE ONLY*****

Completed application received by Town Clerk _____ and _____
(date) (time)

Filing fee \$ _____
(\$250.00)

Signature of Town Clerk _____

Received by Planning Board _____
Signature date

Application No. _____ Date of Joint Public Hearing _____

**Application elements to be included as part of the application for
Site Plan Review**

		The Planning Board may request any additional information it judges to be necessary or convenient, or waive any information requirements it finds unnecessary, for the review of a particular plan.
Administrative Use	Included	Application Elements
		A. Fee paid. Town of Williamsburg exempted.
		B. Each application for Site Plan Review shall be submitted to the Planning Board by the current owner of record, accompanied by eleven (11) copies of the site plan.
		C. A registered architect, surveyor, landscape architect, or professional engineer shall prepare all site plans. All site plans shall be on standard 24" x 36" sheets and shall be prepared at a sufficient scale to show:
		D. The location and boundaries of the lot, adjacent streets or ways, and the location and owners names of all adjacent properties.
		E. Existing and proposed topography including two foot contours, the location of wetlands, streams, water bodies, drainage swales, areas subject to flooding, and unique natural land features.
		F. Existing and proposed structures, including dimensions and elevations.
		G. The location of existing and proposed parking and loading areas, driveways, walkways, access and egress points.
		H. The location and description of all existing and proposed septic systems, water supplies, storm drainage systems, utilities, and refuse and other waste disposal methods.
		I. Proposed landscape features including the location and a description of screening, fencing and plantings.
		J. The location, dimensions height, and characteristics of proposed signs and lighting.
		K. The location and a description of proposed open space or recreation areas.

Meets	Does Not Meet	For Administrative Response Included for Applicant Information
		6.5 Site Plan Review Criteria
		6.51 The following criteria shall be considered by the Planning Board in the review and evaluation of a site plan, consistent with a reasonable use of the site for the purposes permitted or permissible by the regulations of the district in which it is located:
		a. The development shall be integrated into the existing terrain and surrounding landscape, and shall be designed to protect abutting properties and community amenities. Building sites shall, to the extent feasible: 1) minimize impact on wetlands, steep slopes, flood plains, hilltops; 2) minimize obstruction of scenic views from publicly accessible locations; 3) preserve unique natural or historical features; 4) minimize tree, vegetation and soil removal and grade changes; 5) maximize open space retention; and 6) screen objectionable features from neighboring properties and roadways.
		b. In the absence of town services, the development shall be served with adequate water supply and waste disposal systems provided by the applicant. For structures to be served by an on-site waste disposal system, the applicant shall submit a septic system design prepared by a Certified Engineer and approved by the Board of Health.
		c. The plan shall maximize the convenience and safety of vehicular and pedestrian movement within the site and in relation to adjacent ways. The plan shall describe estimated average daily and peak- hour vehicular traffic to be generated by the site, traffic flow patterns for vehicles and pedestrians showing adequate access to and from the site, and adequate circulation within the site.
		d. The site plan shall show adequate measures to prevent pollution of surface or groundwater, to minimize erosion and sedimentation, to prevent changes in groundwater levels, and to prevent increased run-off and potential for flooding. Drainage shall be designed so that run-off shall not be increased and that neighboring properties will not be adversely affected. A system of groundwater recharge shall be provided that does not degrade groundwater quality. Recharge shall be by storm water infiltration basins or a similar system covered with natural vegetation. Dry wells shall be used only where other methods are not feasible. All basins and wells shall be preceded by oil, grease and sediment traps to facilitate removal of contamination. Any and all recharge areas shall be permanently maintained in full working order by the owner.
		e. Electric, telephone, cable TV, and other such utilities are required to be underground unless proven to be physically and environmentally unfeasible.

		f. Exposed storage areas, machinery, service areas, truck loading areas, utility buildings and other unsightly structures or uses shall be set back or visually screened to protect the neighbors from objectionable site characteristics.
		g. Outdoor lighting shall be designed to prevent glare or light, which reflects, strays or scatters beyond the subject structure of structures.
		h. Noise generated by machinery or equipment shall not extend beyond the property line.
		i. The site plan shall comply with all other provisions of this Bylaw.
		6.52 Before a finding on a site plan, the Planning Board may request the applicant to make modifications in the proposed design of the project to ensure that the above criteria are met.
		6.53 After a public hearing, the Planning Board may waive, for good cause shown, any or all requirements of site plan review where such action is in the public interest and not inconsistent with the purpose and intent of the Protective Bylaw.

COPY OF APPLICATION FEES

ZPT ENERGY SOLUTIONS II LLC
215 EXECUTIVE DR
MOORESTOWN NJ 08057

TD BANK
AMERICA'S MOST CONVENIENT BANK

3034

55-136/312

CHECK NUMBER
036

3034

2/13/2019

PAY TO THE ORDER OF Town of Williamsburg

\$ 150.00

One hundred fifty dollars

DOLLARS

Town of Williamsburg

MEMO


AUTHORIZED SIGNATURE

⑈003034⑈ ⑆031201360⑆ 4360332765⑈

ZPT ENERGY SOLUTIONS II LLC
215 EXECUTIVE DR
MOORESTOWN NJ 08057

TD BANK
AMERICA'S MOST CONVENIENT BANK

3033

55-136/312

CHECK NUMBER
036

3033

2/13/2019

PAY TO THE ORDER OF Town of Williamsburg

\$ 100.00

One hundred dollars

DOLLARS

Town of Williamsburg

MEMO


AUTHORIZED SIGNATURE

⑈003033⑈ ⑆031201360⑆ 4360332765⑈

ZPT ENERGY SOLUTIONS II LLC
215 EXECUTIVE DR
MOORESTOWN NJ 08057

TD BANK
AMERICA'S MOST CONVENIENT BANK

3032

55-136/312

CHECK NUMBER
036

3032

2/13/2019

PAY TO THE ORDER OF Town of Williamsburg

\$ 250.00

Two hundred fifty dollars

DOLLARS

Town of Williamsburg

MEMO


AUTHORIZED SIGNATURE

⑈003032⑈ ⑆031201360⑆ 4360332765⑈

MERIDIAN ASSOCIATES INC.
500 CUMMINGS CENTER SUITE 5950
BEVERLY, MA 01915

SALEM FIVE
210 Essex, St
Salem, MA 01970

53-7055/2113

004122

4122

CHECK NO.

Exactly Fifty-two and 50 / 100 Dollars

DATE

2/21/2019

AMOUNT

\$52.50

Town of Williamsburg

**PAY
TO THE
ORDER
OF**

MJD

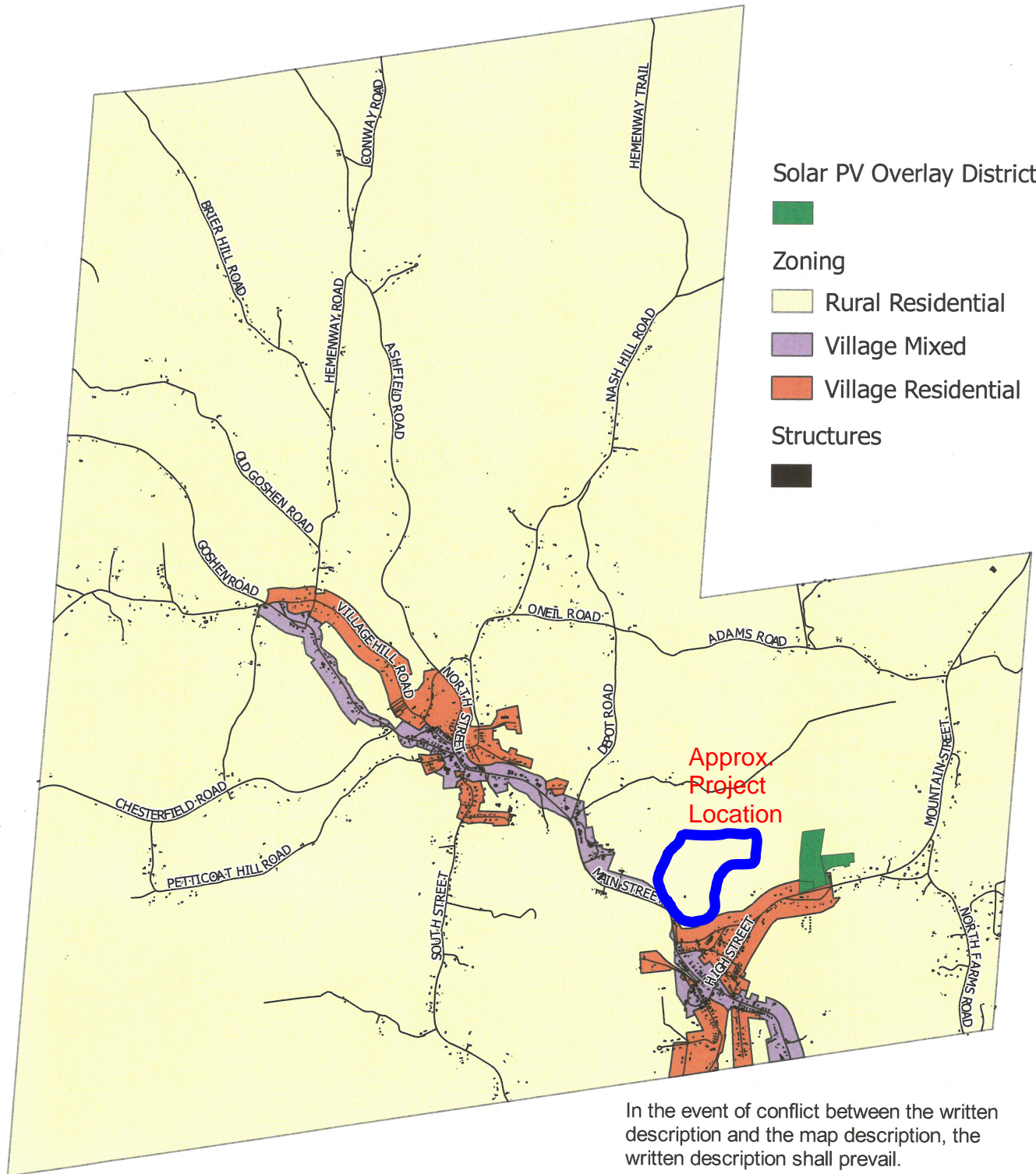
MP

⑆004122⑆ ⑆211370558⑆ ⑆0000510893⑆

ZONING MAP

Town of Williamsburg Zoning Map

May 14, 2013



In the event of conflict between the written description and the map description, the written description shall prevail.

CERTIFIED ABUTTERS LIST

Abutors List for 5 & 5R Hatfield Rd, Haydenville

2/12/2019

<u>Name</u>	<u>Street Address</u>	<u>Mailing Address</u>	<u>Town</u>	<u>Stat</u>	<u>Zipcode</u>	<u>Map & Parcel</u>
Francis & Linda Rowley, Trustees	3R Hatfield Rd	3 Hatfield Rd	Haydenville	MA	01039	G-58.3 & K-15
Philip Skwira	107 Main St	same	Haydenville	MA	01039	K-7
Poverty Mountain Ptrs, LLC	109 Main St	PO Box 231	Williamsburg	MA	01096	K-8
Beverly & Richard Schmith	9 Pondview Dr	same	Haydenville	MA	01039	K-9
Donald Johnson	7 Pondview Dr	same	Haydenville	MA	01039	K-10
Jennifer & Jason Novak	5 Pondview Dr	216 Spring St	Florence	MA	01062	K-11
Brian Wert & Sandra Ginsburg	3 Kingsley Ave	same	Haydenville	MA	01039	K-17
Cherlynn Tetreault & S Halligan	5 Kingsley Ave	same	Haydenville	MA	01039	K-18
David Daley & Jennifer Smedes	7 Kingsley Ave	same	Haydenville	MA	01039	K-19
Suzanne Goodwin	9 Kingsley Ave	same	Haydenville	MA	01039	K-20
Rosemary Keeler & Robert Michels	11 Kingsley Ave	same	Haydenville	MA	01039	K-21
Kenneth Chapin	7 Hatfield Rd	same	Haydenville	MA	01039	K-284
Patricia Larochelle & Margaret Malloy	6 Hatfield Rd	PO Box 445	Haydenville	MA	01039	K-22
William Kopec	2 Dansereau Rd	same	Haydenville	MA	01039	K-23
Holly Hendricks	13 Kingsley Ave	PO Box 293	Haydenville	MA	01039	K-24
Mark & Marie Raffa	15 Kingsley Ave	same	Haydenville	MA	01039	K-25
Susan Davis	8 Round Hill Dr	same	Haydenville	MA	01039	K-26
Richard Muraski & Lisa Phakos	6 Round Hill Dr	same	Haydenville	MA	01039	K-27
Mark Swanson & Rosario Deswanson	12 Hatfield Rd	same	Haydenville	MA	01039	K-28
Joanne Lasker & Daniel Kinsey	2 Round Hill Dr	same	Haydenville	MA	01039	K-29
Stephen & Laurie Lavalley	1 Round Hill Dr	PO Box 224	Haydenville	MA	01039	K-30
Jennie Golash & Nellie Kajka	18 Hatfield St	same	Haydenville	MA	01039	K-31
Evelyn Voorhees & Dean Kent	22 Hatfield Rd	74 Thrasher Hill Rd	Worthington	MA	00198	K-32
Penelope Lampron	21 Hatfield Rd	23 Hatfield Rd	Haydenville	MA	01039	K-34
Donald Owens & Deborah Ogulnick	35 Kingsley Ave	same	Haydenville	MA	01039	K-35
Alan, Peter, Vardic & Rowena Golash	28 Kingsley Ave	PO Box 135	Haydenville	MA	01039	K-36
Brantner & Shoshana Deatley	7 Mountain St	same	Haydenville	MA	01039	K-42
Andrew Erwin, Tr	0 Mountain St	PO Box 51	Williamsburg	MA	01096	K-42.5
Walter & Leslie Boas	6 Maple St	PO Box 266	Haydenville	MA	01039	K-61
Linda & Larry West	95 Main St, R	same	Haydenville	MA	01039	G-77
Lee Lashway	7 Kellogg Rd	94 Audubon Rd	Leeds	MA	01053	G-47

Janet & Julia Ann Peters	91 Mountain St	same	Haydenville	MA	01039 E-27
Town of Williamsburg	0 Walpole Rd	PO Box 447	Haydenville	Ma	01039 G-66.1
Susan Fortgang & David Nehring	16 Walpole Rd	34 Harrison Ave	Northampton	MA	01060 G-65 & G-66
The Brassworks Associates, MT Holyoke Mgmt	132 Main St	667 Main St	Holyoke	MA	01040 K-213

The preceeding is a list of abutors within 300' of 5 & 5R Hatfield Rd, Haydenville, MA (K-33 and G-76.1).
 These parcels are owned by Penelope Johnson, whose mailing address is 5 Hatfield Rd, Haydenville, MA 01039.

We certify, to the best of our abilities, that this is a list of all the abutors to 5 &5R Hatfield Rd, Haydenville, MA 01039

Williamsburg Board of Assessors

Robin Everett
Denise Y Benoit
Alex Everett

DEED INFORMATION

BOOK 3482 PAGE 290 023497

KNOW ALL MEN BY THESE PRESENTS

That I, ANTHONY W. BORAWSKI and ANNA I. BORAWSKI, husband and wife, both of Fort Pierce, Florida

in consideration of \$180,000.00 paid

grant to PENELOPE D. JOHNSON of 27 Norfolk Avenue, Northampton, County of Hampshire, Massachusetts,

with QUITCLAIM COVENANTS,

The land situated at 5 Hatfield Street, Williamsburg, Hampshire County, Massachusetts, and shown on the exhibit attached hereto and made a part hereof.

Executed as a sealed instrument this 13th day of October, 1989

[Handwritten signatures of Anthony W. Borawski and Anna I. Borawski]

Anthony W. Borawski
Anna I. Borawski

THE COMMONWEALTH OF MASSACHUSETTS

Hampshire, ss.

October 13, 1989

Then personally appeared the above named Anthony W. Borawski and Anna I. Borawski and acknowledged the foregoing instrument to be their free act and deed.

Before me
Notary Public Harley M. Sacks
My Commission Expires: 8/3/95

RECORDS & RECORDS
DEEDS REG 13
HAMPSHIRE
CANCELED
TAX 820.80
CHECK 820.80
5669366 12:56
EXCISE TAX

EXHIBIT

That certain tract or parcel of land situated on the northerly side of Hatfield Street in Williamsburg, County of Hampshire, Massachusetts and shown on a plan of land entitled "Plan of Land In Williamsburg, Massachusetts Prepared For Penny Johnson" dated July 7, 1989 and prepared by Harold L. Eaton And Associates, Inc. and recorded in Hampshire County Registry of Deeds in Plan Book , Page , more particularly bounded and described as follows:

Commencing at an iron pin set on the north side of said Hatfield Street; at the southwest corner of the granted premises and at land now or formerly of Massachusetts Electric Company; thence running

N. 29° 36' 15" W., a distance of 39.42 feet to an iron pin; thence running

Along the arc of a curve to the northwest, said curve having a radius of 1,604.28 feet, a distance of 386.83 feet to an iron pin; thence turning and running

N. 74° 44' 30" E., a distance of 66 feet to an iron pin; thence turning and running

N. 15° 15' 30" W., a distance of 900 feet to an iron pin; thence turning and running

S. 74° 44' 30" W., a distance of 33 feet to an iron pin at land now or formerly of Lawrence and Linda West (the last five courses and distances being along land now or formerly of Massachusetts Electric Company); thence turning and running

N. 12° 08' 60" E., a distance of 230.94 feet to an iron pin set in a 30" stump; thence turning and running

S. 82° 57' 20" E., along a barbed wire fence, a distance of 259.80 feet to a point; thence running

S. 84° 53' 29" E., along a stone wall, a distance of 109.57 feet to a point; thence running

S. 74° 43' 57" E., along a barbed wire fence, a distance of 136.90 feet to a fence post; thence turning and running

N. 84° 34' 57" E., along a barbed wire fence, a distance of 59.50 feet to an iron pin; thence running

Along the same course and bearing, 15 feet, more or less, to the thread of a brook; thence turning and running

In a northerly direction along the thread of a brook, a distance of 1,530 feet, more or less, to a point at land now or formerly of Lee H. Lashway (the last seven courses and distances being along land now or formerly of Lawrence and Linda West); thence turning and running

S. 83° 52' 25" E., a distance of 15 feet, more or less, to an iron pin; thence continuing

Along the same course and bearing and a barbed wire fence, a distance of 309.41 feet to an 8" hemlock tree; thence running

S. 79° 56' 21" E., along a barbed wire fence a distance of 213.23 feet, to a 48" oak tree; thence running

S. 82° 27' 33" E., along a barbed wire fence, a distance of 375.82 feet to twin 8" maple trees; thence running

S. 80° 59' 23" E., along a barbed wire fence, a distance of 304.74 feet to a point; thence running

S. 81° 12' 47" E., along a stone wall, a distance of 338.21 feet to a point; thence running

S. 83° 32' 07" E., along said stone wall, a distance of 441.44 feet to a point; thence running

S. 87° 13' 29" E., along said stone wall, a distance of 97.82 feet to a point; thence running

S. 84° 27' 57" E., along said stone wall, a distance of 174.63 feet to a point at the intersection of another stone wall (the last nine courses and distances being along land now or formerly of Lee H. Lashway); thence turning and running

S. 20° 12' 19" W., along a stone wall, a distance of 90.64 feet to a point; thence running

S. 07° 28' 24" W., along said stone wall, a distance of 677.76 feet to a point; thence running

- S. 10° 29' 04" W., along said stone wall, a distance of 501.83 feet to a point at the intersection of another stone wall; thence turning and running
- N. 85° 30' 59" W., along said stone wall, a distance of 126.92 feet to a point; thence running
- N. 74° 51' 48" W., along said stone wall, a distance of 97.15 feet; thence running
- N. 85° 12' 54" W., along said stone wall, a distance of 137.92 feet to a point; thence running
- N. 81° 45' 48" W., along said stone wall, a distance of 86.03 feet to a point; thence running
- N. 85° 46' 27" W., along said stone wall, a distance of 389.85 feet (the last eight courses and distances being along land now or formerly of Allan and Audrey Nelson); thence turning and running
- N. 83° 33' 08" W., a distance of 422.35 feet along said land now or formerly of Allan and Audrey Nelson and land now or formerly of Chester and Ann Kopka, to a point; thence running
- N. 81° 03' 43" W., along said stone wall, a distance of 172.06 feet to a point; thence running
- N. 82° 32' 23" W., along said stone wall, a distance of 293.84 feet to a point; thence turning and running
- S. 03° 47' 20" W., along a barbed wire fence, a distance of 73.85 feet to a fence post; thence running
- S. 09° 53' 60" W., along said barbed wire fence a distance of 165.08 feet to a fence post; thence running
- S. 02° 28' 48" W., along said barbed wire fence, a distance of 176.79 feet to a fence post; thence running
- S. 05° 15' 23" W., along said barbed wire fence, a distance of 458.12 feet to a barbed wire fence on oak; thence running
- S. 10° 13' 13" W., along said barbed wire fence, a distance of 203.90 feet to a barbed wire on oak; thence running

S. 05° 08' 25" W., along said barbed wire fence, a distance of 176.27 feet to an iron pin set on the northwest side of said Hatfield Street (the last eight courses and distances being along land now or formerly of Chester and Ann Kopka); thence running

Along an arc of a curve to the southwest, having a radius of 514.80 feet, a distance of 129.06 feet to a point; thence running

S. 64° 03' 45" W., a distance of 131.70 feet to a point; thence running

Along the arc of a curve to the northwest, having a radius of 289.10 feet, a distance of 136.07 feet to a point; thence running

N. 88° 58' 15" W., a distance of 44.26 feet to an iron pin set at land now or formerly of Paul Sonerson, et al (the last four courses and distances being the northwest and northerly side of said Hatfield Street; thence turning and running

N. 01° 01' 45" E., a distance of 250 feet to a point in swamp; thence turning and running

N. 88° 58' 15" W., a distance of 90 feet, more or less, to the center line of a brook; thence running

In a southwest direction along the center line of a brook, 264 feet, more or less, to a point on the northerly side of said Hatfield Street; thence running

Westerly along the northerly side of said Hatfield Street along the arc of a curve, having a radius of 1008.18 feet, a distance of 56 feet, more or less, to the iron pin set at the place of beginning.

Containing 93.5 acres, more or less, and all as shown on the afore-mentioned plan, which shall be controlling for all purposes.

Meaning and intending to convey and hereby conveying all of the land described in deed of Holiday Beverages, Inc. to Anthony W. Borawski and Anna I. Borawski, dated January 30, 1968 and recorded in the Hampshire County Registry of Deeds, in Book 1523, Page 726.

Hampshire ss.
(MONTH) (DAY) 22 1969 at 12 o'clock and 03 minutes P.M., Rec'd and
exam'd with Hampshire Reg. of Deeds, Book 3482 Page 290
Attest _____
REGISTER

003670

LAWRENCE E. WEST and LINDA A. WEST, husband and wife

of Haydenville, Hampshire

County, Massachusetts,

~~being purchased~~ for consideration paid, and in full consideration of \$20,000.00

grant to PENELOPE D. JOHNSON

of 27 Norfolk Avenue, Northampton, Massachusetts with warranty covenants

the land in Haydenville, Hampshire County, Massachusetts, bounded and described as follows:

[Description and encumbrances, if any]

See Exhibit "A" attached hereto

Off Hatfield Street, Haydenville, MA

CANCELLED

Witness our hand and seal this 11th day of March, 19 91

Lawrence E. West
Linda A. West

The Commonwealth of Massachusetts

Hampshire,

ss.

March 11, 19 91

Then personally appeared the above named Lawrence E. West

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

Eileen H. Locke
Notary Public - Justice of the Peace

My commission expires 19 91

My Commission Expires 03/31/1991

(*Individual -- Joint Tenants -- Tenants in Common.)

CHAPTER 183 SEC. 6 AS AMENDED BY CHAPTER 497 OF 1969

Every deed presented for record shall contain or have endorsed upon it the full name, residence and post office address of the grantee and a recital of the amount of the full consideration thereof in dollars or the nature of the other consideration therefor, if not delivered for a specific monetary sum. The full consideration shall mean the total price for the conveyance without deduction for any liens or encumbrances assumed by the grantee or remaining thereon. All such endorsements and recitals shall be recorded as part of the deed. Failure to comply with this section shall not affect the validity of any deed. No register of deeds shall accept a deed for recording unless it is in compliance with the requirements of this section.

BK 3690PG0314

EXHIBIT A

Located in the village of Haydenville, Williamsburg, Hampshire County, Massachusetts, bounded and described as follows:

The parcel hereby conveyed is an entirely land-locked parcel located north of Hatfield Street in Haydenville and adjoining the parcel shown on Plan of Land in Williamsburg, Massachusetts, prepared for Penelope D. Johnson, dated July 7, 1989, Harold L. Eaton and Associates, Inc., recorded in Hampshire Registry of Deeds, Book of Plans 164, Page 34. The parcel hereby conveyed begins at a point located twenty-five (25.80) feet S. 82° 57' 20" E. from an iron pin set in a 32" stump on the Westerly line of the parcel shown in the above described plan (which parcel is hereinafter referred to as the Main Johnson Parcel), and on the line between the Main Johnson Parcel and the land of Lawrence and Linda West, thence running N. 34° 37' 22" E. a distance of seven hundred eighty-six and nine hundredths (786.89) feet to a found iron pin in a stone wall; thence turning and running S. 79° 15' 16" E. a distance of three hundred twenty-two (322) feet more or less to the center line of a brook, the last two courses being along the remaining land of Lawrence E. West and Linda A. West, thence turning and following the center line of said brook eight hundred fifty-five (855) feet more or less along the Main Johnson Parcel to a point in said center line of the brook; the straight line distance from west bank to west bank (being 15 feet from the center of the brook in each case) being six hundred ninety-two and seventy-seven hundredths (692.77) feet on a bearing of S. 13° 04' 05" W.; thence turning and running S. 84° 34' 57" W. from the center of the brook a distance of seventy-four and fifty hundredths (74.50) feet to a point; thence continuing N. 74° 43' 57" W. a distance of one hundred thirty-six and ninety hundredths (136.90) feet to a point in a stone wall; thence continuing N. 84° 53' 29" W. a distance of one hundred nine and fifty-seven hundredths (109.57) feet along said stone wall to a point, thence continuing N. 82° 57' 20" W. a distance of two hundred thirty-four and eighty hundredths (234.80) feet to the place of beginning.

Containing 6.86 acres more or less.

Being all and the same parcel shown on plan of Land in Williamsburg, Massachusetts, surveyed for Penelope D. Johnson, dated June 11, 1990, Almer Huntley, Jr. & Associates, Inc., recorded in Hampshire Registry of Deeds, Book of Plans 167, Page 79.

Being a portion of the property conveyed to Lawrence E. West and Linda A. West by deed recorded in Hampshire County Registry, Book 2086, Page 65.

SUBJECT TO Chapter 61A lien recorded at Book 2406, Page 153.

Sewer betterment recorded at Book 2246, Page 202 benefits only the remaining land of the grantors, and grantors warrant that they will see to the payment thereof.

Grantors warrant that none of the improvements to the property referred to in the UCC Form I, recorded at Book 2568, Page 8, are located on the conveyed parcel.

Hampshire ss. Maw 11 1991 at 10 o'clock and 57 minutes A.M., Rec'd ent'd and
(MONTH) (DAY)
exam'd with Hampshire Reg. of Deeds, Book 3690 Page 313

Attest _____
REGISTER



TO: TOWN OF WILLIAMSBURG
FROM: CHRISTOPHER RYAN - MERIDIAN ASSOCIATES
SUBJECT: SUPPORTING DOCUMENTATION FOR A SPECIAL PERMIT / SITE PLAN REVIEW APPLICATION FOR A LARGE-SCALE GROUND-MOUNTED SOLAR PHOTOVOLTAIC FACILITY (SPF) TO BE LOCATED AT 5 & 5R HATFIELD STREET
DATE: FEBRUARY 19, 2019
CC: ZPT ENERGY SOLUTIONS II, LLC

Project Objective:

The proposed Solar Photovoltaic Facilities Project (“SPF”) shall enhance the public health, safety, and welfare of the inhabitants of the town by generating onsite clean, renewable energy which directly offsets brown power generated from the electric utility eliminating greenhouse gas emissions.

The project consists of the installation of a 14.1± acre ground-mounted solar array in the Rural (RU) Zoning District; per Section 3.0 “Use Table” an SPF is a Permitted Use with Site Plan Review (Planning Board) and a Special Permit (Zoning Board of Appeals). In support of this use we offer the following based on the criteria set forth in the “The Commonwealth of Massachusetts Town of Williamsburg Application for Site Plan Review” document; Section 5 “Special Permits”, Section 6 “Site Plan Review, and Section 9.30 “Ground-mounted Solar Photovoltaic Installation requirements”.

Application Elements to be Included as Part of the Application for Site Plan Review

A. Fee paid. Town of Williamsburg exempted.

- **A copy of the \$250.00 application fee has been included as a part of the submittal package.**

Each application for Site Plan Review shall be submitted to the Planning Board by the current owner of record, accompanied by eleven (11) copies of the site plan.

- **Eleven (11) copies of the Site Plan and associated supporting materials have been provided to the Town as a part of the submittal package.**

B. A registered architect, surveyor, landscape architect, or professional engineer shall prepare all site plans. All site plans shall be on standard 24" x 36" sheets and shall be prepared at a sufficient scale to show:

- **The Site Plans have been prepared on 24” x 36” paper and have been signed and sealed by a registered professional engineer.**



- C. The location and boundaries of the lot, adjacent streets or ways, and the location and owners names of all adjacent properties.**

 - **The required information has been provided in the Permit Plan Set.**
- D. Existing and proposed topography including two foot contours, the location of wetlands, streams, water bodies, drainage swales, areas subject to flooding, and unique natural land features.**

 - **The required information has been provided in the Permit Plan Set.**
- E. Existing and proposed structures, including dimensions and elevations.**

 - **The only proposed structures are the solar racks. A detail is shown on sheet 13 of the Permit Plan Set.**
- F. The location of existing and proposed parking and loading areas, driveways, walkways, access and egress points.**

 - **The required information has been provided in the Permit Plan Set.**
- G. The location and description of all existing and proposed septic systems, water supplies, storm drainage systems, utilities, and refuse and other waste disposal methods.**

 - **The proposed storm drainage system is depicted on the plan set and stormwater report. MAI has contacted Williamsburg's utility providers and depicted all utilities that were provided. No waste will be generated from the project.**
- H. Proposed landscape features including the location and a description of screening, fencing and plantings.**

 - **Due to the isolated proximity of the panels the existing wooded land will provide adequate screening.**
- I. The location, dimensions height, and characteristics of proposed signs and lighting.**

 - **There will be no proposed lighting. There will be a proposed site identification sign whose location is depicted on the plan set, and was depicted on the approved plan set for the 95 Main Street solar array project, owned by Mr. Larry West.**
- J. The location and a description of proposed open space or recreation areas.**



➤ **Not applicable.**



SECTION 5.3 Special Permit Actions by the Applicant

5.31 The applicant shall file a Special Permit Application, a filing fee, a list of the abutters, and six (6) copies of the required site plan with the Zoning Board of Appeals. Applications are available from the Town Clerk.

➤ **Six (6) copies of the Site Plan, the application, the filing fee and a certified abutters list have been provided to the Zoning Board of Appeals as a part of the submittal package.**

5.32 The applicant is responsible for filing one (1) copy of the Special Permit Application with the Town Clerk. The effective date of filing is the date the application is filed with the Town Clerk.

➤ **A copy of the Special Permit Application has been filed with the Town Clerk.**

5.33 Filing fee to cover the expense of legal notices and administration costs shall be set by the Zoning Board of Appeals (See paragraph 5.41). The fee shall be delivered with the application.

➤ **Understood.**

5.34 The applicant shall file with the application a list of abutters with their addresses as they appear on the most recent applicable tax list. Abutters include all landowners within three hundred (300) feet of the property line of the petitioner, notwithstanding that the land of any owner is located in another city or town, as deigned by Section 11, Chapter 40A, General Laws, as amended.

➤ **A certified abutters list has been submitted in the package.**

5.35 The applicant shall file with the application a plan(s) of any proposed sign(s) showing the location and design. Such signs shall conform to all provisions of this Bylaw.

➤ **A signage plan is not necessary since there will only be one proposed sign.**

5.5 Criteria

Where a Special Permit may be authorized by the Zoning Board of Appeals under this Bylaw, said Authority may grant, upon written application, such Special Permit if it finds among other findings:



- a. **That the structure and use will be reasonably compatible with the character and scale of other uses permitted as of right in the same district.**
 - **There are no proposed structures.**
- b. **That the use will not constitute a nuisance by reason of an unacceptable level of air or water pollution, or excessive noise.**
 - **There will be no air or water pollution. The noise generated by the solar panels is minor and will not be audible to any abutters.**
- c. **The proposed use shall comply with any and all additional Special Permit criteria or special use regulation imposed by this Bylaw.**
 - **Understood.**
- d. **The proposed project shall not create a significant adverse impact to the quality of surface water or groundwater during and after construction, and provision shall be made for maximizing groundwater recharge.**
 - **A stormwater system has been proposed to address the above items.**
- e. **The design of the project shall provide for adequate methods of disposal of sewage, refuse or other waste generated by the proposed use.**
 - **No waste will be generated from the project once completed.**
- f. **The design of the project shall minimize the visibility of visually degrading elements and protect the neighboring properties from potentially detrimental or offensive uses through the use screening or vegetated buffer zones.**
 - **Due to the isolated proximity of the panels the existing wooded land will provide adequate screening.**

5.6 Site Plan Requirements

In all instances where a Special Permit is required for the proposed uses as specified in the Schedule of Use Requirements, no building or structure shall be erected or externally enlarged, or operation conducted, and no area for parking, loading or vehicular service (including driveways giving access thereto) shall be established or changed, except in conformity with a site plan bearing the endorsement of approval of the Zoning Board of Appeals. Said site plan shall show, the following and any other relevant items that the Zoning Board of Appeals may require: All existing and proposed buildings and structures and their uses, parking areas, loading areas, driveways, service areas, and all other open space areas, all facilities for sewer, refuse and other waste disposal and for surface water



drainage, zoning district boundaries, and all landscape features (such as walks, planting areas, trees, fences, and signs) on the lot. Said plan shall be subject to such rules relating to scale, dimensions, legend, form and preparation as may from time to time be promulgated by the Zoning Board of Appeals.

➤ **Understood.**

5.7 Conditions, Safeguards, Limitations

In granting a Special Permit, the Zoning Board of Appeals may, in accordance with MGL Chapter 40A, impose conditions, safeguards and limitations to be enforced in accordance with section 7. Such conditions, safeguards, and limitations shall be in writing and may include but are not limited to the following:

a. **Front, side and rear yards greater than the minimum required by this Bylaw; screening buffers or planting strips, fencing or wall as specified by the Zoning Board of Appeals.**

➤ **Understood.**

b. **Limitations of size, number of occupants, method or time of operation or extent of facilities.**

➤ **Understood.**

c. **Regulations of number and location of driveways, or other traffic features and off street parking or loading requirements, or special permit features beyond the minimum required by this Bylaw.**

➤ **Understood.**

d. **Screening of parking areas or other parts of the premises from adjoining properties or from streets by the use of walls, fences, plantings or other such devices.**

➤ **No parking areas are being proposed.**

e. **Measures to protect against environmental pollution.**

➤ **Understood.**

f. **Performance bond or other security to ensure that the project meets the conditions specified in the Special Permits. Any conditions, safeguards or limitations shall be imposed in writing and shall be made a part of the special permit.**



- **Performance Bond will be provided by the Applicant.**



Section 6.3 Required Site Plan Content

A registered architect, surveyor, landscape architect, or professional engineer shall prepare all Site Plans. All Site Plans shall be on standard 24" x 36" sheets and shall be prepared at a sufficient scale to show:

- a. **The location and boundaries of the lot, adjacent streets or ways, and the location and owners' names of all adjacent properties.**

- **The required information has been provided in the Permit Plan Set.**

- b. **Existing and proposed topography including two-foot contours, the location of wetlands, streams, water bodies, drainage swales, areas subject to flooding, and unique natural land features.**

- **The required information has been provided in the Permit Plan Set.**

- c. **Existing and proposed structures, including dimensions and elevations.**

- **There are no proposed structures.**

- d. **The location of existing and proposed parking and loading areas, driveways, walkways, access and egress points.**

- **The required information has been provided in the Permit Plan Set.**

- e. **The location and description of all existing and proposed septic systems, water supplies, storm drainage systems, utilities, and refuse and other waste disposal methods.**

- **The proposed storm drainage system is depicted on the plan set and stormwater report. MAI has contacted Williamsburg's utility providers and depicted all utilities that were provided. No waste will be generated from the project.**

- f. **Proposed landscape features including the location and a description of screening, fencing and plantings.**

- **Due to the isolated proximity of the panels the existing wooded land will provide adequate screening.**

- g. **The location, dimensions height, and characteristics of proposed signs and lighting.**



- **There will be no proposed lighting. There will be one proposed site identification sign whose location is depicted on the plan set.**
- h. The location and a description of proposed open space or recreation areas.**
- **Not Applicable.**
- i. The Planning Board may request any additional information it judges to be necessary or convenient, or waive any information requirements it finds unnecessary, for the review of a particular plan.**
- **Understood.**

Section 6.5 Site Plan Review Criteria

6.51 The following criteria shall be considered by the Planning Board in the review and evaluation of a Site Plan, consistent with a reasonable use of the site for the purposes permitted or permissible by the regulations of the district in which it is located:

- a. The development shall be integrated into the existing terrain and surrounding landscape, and shall be designed to protect abutting properties and community amenities. Building sites shall, to the extent feasible:**
 - 1. Minimize impact on wetlands, steep slopes, flood plains, hilltops**
 - **The proposed SPF has been designed with a single wetland crossing and to avoid any wetland buffers to the greatest extent practicable. No areas of potential flooding are affected. See the Erosion Control Plan for measures used to protect steep slopes.**
 - 2. Minimize obstruction of scenic views from publicly accessible locations**
 - **The proposed SPF project should not obstruct any scenic views.**
 - 3. Preserve unique natural or historical features**
 - **The proposed SPF project does not affect unique natural or historical features.**
 - 4. Minimize tree, vegetation and soil removal and grade changes**
 - **The proposed SPF project has minimal grading to preserve the existing topography, and the minimum tree clearing necessary in order for the system to function efficiently.**



5. **Maximize open space retention**
 - **The proposed SPF project maximizes the retention of open space.**
6. **Screen objectionable features from neighboring properties and roadways**
 - **The existing wooded land will screen objectionable features from neighboring properties and roadways.**
- b. **In the absence of town services, the development shall be served with adequate water supply and waste disposal systems provided by the applicant. For structures to be served by an on-site waste disposal system, the applicant shall submit a septic system design prepared by a Certified Engineer and approved by the Board of Health.**
 - **The proposed SPF project does not require domestic water or an on-site sanitary sewage disposal system.**
- c. **The plan shall maximize the convenience and safety of vehicular and pedestrian movement within the site and in relation to adjacent ways. The plan shall describe estimated average daily and peak- hour vehicular traffic to be generated by the site, traffic flow patterns for vehicles and pedestrians showing adequate access to and from the site, and adequate circulation within the site.**
 - **Access for the proposed solar development is achieved via the permitted access driveway associated with the Larry West array (95 Main Street). The access is not open to the public and the proposed development will not have any effect on daily traffic conditions. The expected traffic generation from the project consists of one or two maintenance vehicles every three to six months. The low growth meadow seed mixes utilized across the site will only require maintenance one or two times per year. As a result, any traffic generated by the proposed development will be very minimal at an irregular frequency and will have no impacts on traffic. As such, existing traffic conditions will be unaffected, traffic flow patterns will remain unchanged and there will be no impact upon existing abutting public and private ways.**
- d. **The site plan shall show adequate measures to prevent pollution of surface or groundwater, to minimize erosion and sedimentation, to prevent changes in groundwater levels, and to prevent increased run-off and potential for flooding. Drainage shall be designed so that run-off shall not be increased and that neighboring properties will not be adversely affected. A system of groundwater recharge shall be provided that does not degrade groundwater quality. Recharge 'shall be by storm water infiltration basins or a similar system covered with natural vegetation. Dry wells shall be used only where other methods are not feasible. All basins and wells shall be preceded by oil, grease and sediment traps to**



facilitate removal of contamination. Any and all recharge areas shall be permanently maintained in full working order by the owner.

- **The project as designed will not increase runoff to neighboring properties. The proposed SPF project will implement stormwater features that will provide for infiltration and treatment of stormwater runoff. A stormwater management plan has been prepared and included with this submittal packet. An erosion control plan is also included in the plan set.**
- e. **Electric, telephone, cable TV, and other such utilities are required to be underground unless proven to be physically and environmentally unfeasible.**
 - **Onsite electric will be in underground conduit in all feasible locations.**
- f. **Exposed storage areas, machinery, service areas, truck loading areas, utility buildings and other unsightly structures or uses shall be set back or visually screened to protect the neighbors from objectionable site characteristics.**
 - **Exposed storage areas, and other unsightly structures or uses have been set back and/or visually screened to protect the neighbors from objectionable site characteristics.**
- g. **Outdoor lighting shall be designed to prevent glare or light, which reflects, strays or scatters beyond the subject structure of structures.**
 - **The proposed SPF project does not propose exterior lighting.**
- h. **Noise generated by machinery or equipment shall not extend beyond the property line.**
 - **The proposed SPF project generates minimal noise from machinery that will not be audible to any abutters.**
- i. **The site plan shall comply with all other provisions of this Bylaw.**
 - **The proposed SPF project Site Plans are designed to comply with all other provisions of the bylaw.**
- 6.52 **Before a finding on a site plan, the Planning Board may request the applicant to make modifications in the proposed design of the project to ensure that the above criteria are met.**
 - **Should changes to the Site Plan be requested, the applicant will work with the town to address any requested plan changes.**



6.53 After a public hearing, the Planning Board may waive, for good cause shown, any or all requirements of site plan review where such action is in the public interest and not inconsistent with the purpose and intent of the Protective Bylaw.

➤ **The Applicant concurs that after a public hearing, the Planning Board may waive, for good cause shown, any or all requirements of Site Plan Review where such action is in the public interest and not inconsistent with the purpose and intent of this Bylaw.**

➤

Section 9.30-4 Site Plan Review

9.30-4.1 All plans and maps shall be prepared, stamped and signed by a Professional Engineer licensed to practice in Massachusetts.

➤ **The proposed Site Plans have been prepared by and stamped by a Professional Engineer.**

9.30-4.2 Pursuant to the required site plan content described in Section 6.3 of the Zoning Bylaw, the project proponent shall provide the following additional documents and information. The Planning Board (or Zoning Board of Appeals, if special permit as applicable) may waive any of these requirements as it deems appropriate.

(a) A site plan showing:

i. Property lines and physical features, including roads for the project site, wetlands, wildlife corridors and other relevant features;

➤ **Included in the proposed Site Plans.**

ii. Location and approximate height of tree cover, including any trees on public property that are age 75 years and older or with a diameter of 36 inches or greater, and any trees that are within the jurisdiction of the Tree Warden;

➤ **Tree heights are shown on the Record Conditions Plan. No trees on public property or within the jurisdiction of the tree warden will be altered.**

iii. Proposed changes to the landscape of the site, including roads, grading, vegetation clearing and planting, roads, parking areas, exterior lighting, screening vegetation or structures;

➤ **Included in the proposed Site Plans.**

iv. Blueprints or drawings of the solar photovoltaic installation signed by a



Professional Engineer licensed to practice in the Commonwealth of Massachusetts showing the proposed layout of the system and any potential shading from structures and vegetation, including those on abutting property(ies);

➤ **Included in the proposed Site Plans.**

v. **A three-line electrical diagram detailing the solar photovoltaic installation, associated components, and electrical interconnection methods, with all National Electrical Code compliant disconnects and overcurrent devices;**

➤ **Included in the submittal package.**

vi. **Documentation of the major system components to be used, including the photovoltaic panels, mounting system, and inverter;**

➤ **Included in the submittal package.**

vii. **Name, address, and contact information for the proposed system installer;**

➤ **Pro-Tech Energy Solutions, 215 Executive Drive, Moorestown, NJ 08057, (856) 437-6220 (office)**

viii. **Name, address, phone number and signature of the project proponent, as well as all co-proponents and property owners, if any;**

➤ **Included in the submittal package.**

ix. **The name, contact information and signature of any agents representing the project proponent; and**

➤ **Included in the submittal package.**

(b) **Documentation of actual or prospective access and control of the project site (see also Section 9.30-5);**

➤ **Documentation of actual or prospective access and control of the project site has been provided in the submittal package.**

(c) **An operation and maintenance plan (see also Section 9.30-6);**

➤ **An Operations and Maintenance Plan has been provided in the submittal package. (See attachment #6). See the stormwater report for a detailed Stormwater O&M.**

(d) **Zoning district designation for the parcel(s) of land comprising the project**



site (submission of a copy of a zoning map with the parcel(s) identified is suitable for this purpose);

➤ A copy of the Zoning Map has been included in the submittal package.

(e) **Proof of liability insurance consistent with industry standards for the proposed facility**

➤ Proof of liability insurance has been provided in the submittal package.

(f) **Description of financial surety that satisfies Section 9.30-13;**

➤ The applicant requests that this item be included as a condition of approval. The decommissioning and removal of the equipment depicted on the Permit Site Plan may require revisions as we work through the permitting process. We request that prior to the issuance of a building permit, the applicant shall submit a decommissioning plan and receive approval from the Planning Board that satisfies this requirement.

(g) **Pre- and post-construction color photorealistic visualizations of the existing site and proposed large-scale ground-mounted solar photovoltaic installation from at least four perspectives (with a total of at least 180-degree separation) specified by the permitting authority, including from the nearest residential structure and of the area(s) that are most publicly visible, with technical explanation of how visualization was produced.**

➤ Photorealistic visualizations will be provided at the public hearings for the Board members.

9.30-5 The project proponent shall submit documentation of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed solar photovoltaic installation.

➤ Proof of actual or prospective access and control of the project site sufficient to allow for construction and operation of the proposed solar photovoltaic installation has been included in the submittal package.

9.30-6 The project proponent shall submit a plan for the operation and maintenance of the ground- mounted solar photovoltaic installation, which shall include measures for maintaining safe access to the installation, storm water controls, as well as general procedures for operational maintenance of the installation.

➤ An Operations and Maintenance Plan for the system will be provided. See the stormwater report for a detailed Stormwater O&M plan.



9.30-7 No ground-mounted solar photovoltaic installation shall be constructed until evidence has been given to the Planning Board that the utility company that operates the electrical distribution system grid where the installation is to be located has been informed by the owner or operator of the proposed solar photovoltaic installation of their intent to install an interconnected customer-owned generator.

- **Evidence has been given to the Planning Board that the utility company operates the electrical distribution system grid where the installation is to be located and has been informed by the owner or operator of the proposed solar photovoltaic installation of their intent to install an interconnected customer-owned generator.**

9.30-8 Dimension and Density Requirements

9.30-8.1 The setbacks for ground-mounted solar photovoltaic installations, including appurtenant structures and parking areas, shall be at least 50 feet from any property boundary. The setback areas shall not be included in the calculation of the size of the ground-mounted solar voltaic installation. The height of a ground-mounted solar photovoltaic installation or any appurtenant structure shall comply with the requirements of Sections 4.4 and 4.5 of the Williamsburg Zoning Bylaw.

- **Setback Requirements: The proposed SPF project is setback more than fifty (50) feet from the property lines and the panels are less than forty (40) feet in height.**

9.30-8.2 The lot coverage requirements of Section 9.3 of the Williamsburg Zoning Bylaw do not apply to ground-mounted solar photovoltaic installations.

- **Understood.**

9.30-8.3 All appurtenant structures to ground-mounted solar photovoltaic installations shall comply with the requirements of Section 9.2 Accessory Structures of the Williamsburg Zoning Bylaw. All such appurtenant structures include but are not limited to equipment shelters, storage facilities, transformers, and substations.

- **The proposed SPF project complies with the requirements for appurtenant structures.**

9.30-9 Design Standards

9.30-9.1 Lighting of solar photovoltaic installations shall be consistent with Section 9.12 of the Williamsburg Zoning Bylaw and all other applicable state and federal laws. Lighting of other parts of the installation, such as appurtenant



structures, shall be limited to that required for safety and operational purposes, and shall be reasonably shielded from abutting properties. Where feasible, lighting of the solar photovoltaic installation shall be directed downward and shall incorporate full cut-off fixtures to reduce light pollution.

- **The proposed SPF project does not include exterior lighting.**

9.30-9.2 Any signs on ground-mounted solar photovoltaic installations and property shall comply with Section 9.8 Sign Restrictions of this Zoning Bylaw. A sign shall be required to identify the owner and provide a 24-hour emergency contact phone number. Solar photovoltaic installations shall not be used for displaying any advertising except for reasonable identification of the manufacturer or operator of the solar photovoltaic installation.

- **The proposed SPF projects signage is in compliance with the Bylaw.**

9.30-9.3 Reasonable efforts, as determined during the site plan review, shall be made to place all utility connections from the solar photovoltaic installation underground, depending on appropriate soil conditions, shape, and topography of the site and any requirements of the utility provider. Electrical transformers for utility interconnections may be above ground if required by the utility provider.

- **The proposed SPF project depicts the proposed utilities to be located underground where possible.**

9.30-9.4 All land associated with the ground-mounted solar installation shall be covered and grown in natural vegetation. All ground surface areas beneath solar arrays and setback areas shall be pervious to maximize on-site infiltration of stormwater. Impervious paving of areas beneath solar arrays is prohibited. To the greatest extent possible, a diversity of plant species shall be used, with preference given to species that are native to New England. Use of plants identified by the most recent copy of the “Massachusetts Prohibited Plant List” maintained by the Massachusetts Department of Agricultural Resources is prohibited. Herbicides shall be applied only by properly licensed personnel in conformance with all applicable state regulations.

- **The proposed SPF project proposes ground surface areas beneath solar arrays and setback areas as pervious cover comprised of natural vegetation.**

9.30-9.5 Reasonable on-site parking is required for vehicles that will service the installation only. The requirements of Section 9.6 Off-street Parking of the Williamsburg Zoning Bylaw do not apply. The requirements of Section 10



Driveway Standards of the Williamsburg Zoning Bylaw do apply. The frontage requirements of Section 9.0 of the underlying district do apply.

- **There are no proposed parking or loading areas as a result of this project. Within the array area, adequate distance from the drive to the proposed fence was provided. The proposed project will only result in occasional vehicles for routine maintenance a few times per year accessed from the proposed entrance.**

9.30-9.6 The plan for a ground-mounted solar photovoltaic installation shall be designed to maximize the preservation of on-site and abutting natural and developed features. In natural (undeveloped) areas, existing vegetation shall be retained to the greatest extent possible, especially where such vegetation provides a benefit to the natural environment. In developed areas, the design of the installation shall consider and incorporate human-designed landscape features to the greatest extent, including contextual landscaping and landscape amenities that complement the physical features of the site and abutting properties. Whenever reasonable, structures should be screened from view by vegetation and/or joined or clustered to avoid adverse visual impacts and be architecturally compatible with each other. Vegetation shall be of varieties native to New England. Vegetative screening shall reach a mature form to effectively screen the installation within five years of installation. The mature height of the vegetated screening shall be such that the installation's structures are not apparent to a person upon any public road and viewing the installation from a height of 10 feet. Planting of the vegetative screening shall be completed prior to final approval of the photovoltaic installation by the Building Inspector.

- **The proposed SPF project has been designed such that the installation's structures are not apparent to a person upon any public road and viewing the installation from a height of ten (10) feet. The site will have adequate remaining natural screening between the proposed system and abutting properties.**

9.30-10 Safety and Environmental Standards

9.30-10.1 The owner or operator of the ground-mounted solar photovoltaic installation shall provide a copy of the project summary, electrical schematic, and site plan to the Williamsburg Fire Chief. Upon request, the owner or operator shall cooperate with local emergency services in developing an emergency response plan. All means of disconnecting the solar photovoltaic installation shall be clearly marked. The owner or operator shall identify and provide contact information for a person who is responsible for responding to all public and emergency inquiries related to the installation. This information shall be updated as needed.



- **Access to the solar energy facility will be from land now or formerly Lee H. Lashaway utilizing a proposed eighteen (18) foot wide access drive to the solar arrays. The solar energy facilities will be secured from unauthorized access with a seven (7) foot tall perimeter chain link fence and gates. The twenty-four (24) foot wide control gate will be located at each array. A Knox box will be located at the main gate and municipal emergency personnel will have key access to the boxes for entry to the facility as necessary. Signs will be placed at the gates, as well as around the perimeter fencing to make it clear that unauthorized access to the facility is prohibited. The applicant or operator shall provide a copy of the project summary, electrical schematic, and site plan to the Fire Chief and Police Chief, shall identify a responsible person for public inquiries throughout the life of the SPF, and all means of shutting down the SPF shall be clearly marked prior to the issuance of a Building Permit.**

9.30-10.2 Clearing of natural vegetation shall be limited to that which is necessary for the construction, operation and maintenance of the ground-mounted solar photovoltaic installation or otherwise prescribed by applicable laws, regulations, and bylaws. Sufficient vegetation shall be maintained to minimize soil erosion. Ground-mounted solar photovoltaic installations shall be installed only upon water permeable surfaces as approved during site plan review.

- **The proposed SPF project has been designed to be limited to clearing only that area which is necessary for the construction, operation, removal of shade and maintenance of the ground-mounted solar photovoltaic installation.**

9.30-10.3 Ground-mounted solar photovoltaic installations shall be designed and constructed to preserve and maintain the health and root systems of significant trees on public property and within the jurisdiction of the Tree Warden that are age 75 years and older or at least three feet in diameter at a height of four feet above the ground. Any removal of trees on public property shall be consistent with MGL Chapter 87 Shade Trees, MGL Chapter 40 Section 15C Scenic Road Designations and all other applicable laws and regulations.

- **No portion of the SPF project is located within public property, and as such, no mature trees located on public property will be impacted.**

9.30-10.4 Ground-mounted solar photovoltaic installations shall be designed and constructed to minimize the impacts on and optimize the maintenance requirements of wildlife corridors.

- **The proposed SPF project has been designed to minimize the impacts on and optimize the maintenance requirements of wildlife corridors. A wildlife habitat study will be undertaken by the applicant and presented to the Board.**



9.30-10.5 Hazardous materials that are stored, used, or generated on site shall not exceed the amount for a Very Small Quantity Generator of Hazardous Waste as defined by Massachusetts Department of Environmental Protection regulations 310 CMR 30.000 and shall meet all applicable requirements, including storage of hazardous materials in a building with an impervious floor that is not adjacent to any floor drains to prevent discharge to the outside environment. If hazardous materials are utilized within the solar electric equipment, then impervious containment areas capable of controlling any release to the environment and to prevent potential contamination of groundwater are required.

- **The proposed SPF project does not require the use or storage of any hazardous materials or chemicals.**

9.30-11 Monitoring and Maintenance

9.30-11.1 The owner or operator of the ground-mounted solar photovoltaic installation shall maintain the facility in good condition. Maintenance shall include, but not be limited to, painting, structural repairs, landscaping and integrity of security measures. Site access shall be maintained to a level acceptable to the Williamsburg Fire Chief, Building Inspector and Electrical Inspector. The owner or operator shall be responsible for the cost of maintaining the installation and any access road(s), unless accepted as a public way.

- **Refer to the previously stated Operations and Maintenance Plan.**

9.30-11.2 All material modifications to a solar photovoltaic installation made after issuance of the required building permit shall require approval by the Planning Board.

- **The owner / operator understands that modifications to a solar photovoltaic installation made after issuance of the required building permit shall require approval by the Planning Board.**

9.30-11.3 The owner or operator of the installation shall submit an Annual Report which certifies compliance with the requirements of this bylaw and the approved site plan. The Annual Report shall also provide information on the quantity of electricity generated, the percentage of generated electricity that was used off site, and maintenance completed during the course of the year. The Annual Report shall include a reasonable photo survey of the installation. The report shall be submitted to the Select Board and the Planning Board no later than June 30 of each year. The owner or operator



shall allow and make arrangements for an authorized agent of the Town of Williamsburg to enter the property to verify the contents of the Annual Report following its submittal if requested.

- **The owner or operator of the installation will submit an Annual Report which certifies compliance with the requirements of the bylaw and the approved site plan. The Annual Report shall also provide information on the quantity of electricity generated, the percentage of generated electricity that was used off site, and maintenance completed during the course of the year. The Annual Report shall include a reasonable photo survey of the installation. The report will be submitted to the Select Board and the Planning Board no later than June 30 of each year. The owner or operator will allow and make arrangements for an authorized agent of the Town of Williamsburg to enter the property to verify the contents of the Annual Report following its submittal if requested.**

9.30-12 Removal Requirements and Abandonment

9.30-12.1 Absent notice of a proposed date of decommissioning, the filing of an annual report as required in 9.30-11.3, or written notice to the Planning Board of extenuating circumstances, the solar photovoltaic installation shall be considered abandoned when it fails to operate for more than one year without a written waiver of consent of the Planning Board. If the owner or operator of the large-scale ground-mounted solar photovoltaic installation fails to remove the installation in accordance with the requirements of this section within 150 days of abandonment or the proposed date of decommissioning, the town or its agents may enter the property and physically remove the installation, the full cost of which shall be the responsibility of the owner or operator.

- **Understood**

9.30-12.2 Any ground-mounted solar photovoltaic installation which has reached the end of its useful life or has been abandoned consistent with Section 9.30-12.1 of this bylaw shall be removed. The owner or operator shall physically remove the installation no more than 150 days after the date of discontinued operations. The owner or operator shall notify the Planning Board by certified mail of the proposed date of discontinued operations and plans for removal. Decommissioning shall consist of:

- (a) **Physical removal of all ground-mounted solar photovoltaic installations, structures, equipment, security barriers and electrical lines from the site;**

- **Understood.**



- (b) **Disposal of all solid and hazardous waste in accordance with local, state, and federal waste disposal regulations;**
 - **Understood.**
- (c) **Stabilization and re-vegetation of the site as necessary to minimize erosion. The Planning Board may allow the owner or operator to leave landscaping or designated below-grade foundations to minimize erosion and disruption to vegetation.**
 - **Understood.**

9.30-13 Financial Surety

The project proponent of ground-mounted solar photovoltaic projects shall provide a form of surety, either through escrow account, bond or otherwise, to cover the cost of removal in the event the town becomes responsible for removing the installation and remediating the landscape. The amount and form of the surety shall be determined to be reasonable by the permitting authority, but in no event should exceed more than 125 percent of the cost of removal and compliance with the additional requirements set forth herein, as determined by the project proponent. Such surety is not required for municipally-owned or state-owned facilities. The project proponent shall submit a fully inclusive estimate of the costs associated with removal prepared by a qualified engineer. The amount shall include a mechanism for calculating increased removal costs due to inflation.

- **A decommissioning letter outlining the cost of removal in the event the Town must remove the facility and restore the landscape has been attached. The decommissioning amount has included a mechanism for calculating increased removal costs due to inflation. The applicant will coordinate with the Town to set up a mutually agreed upon form of surety for the decommissioning of the system.**

9.30-14 Upon request of the Planning Board, the proponent shall pay for a licensed third-party Independent Engineer selected by the permitting authority to review submittals on their behalf.

- **Understood**

**ATTACHMENT 1:
PROOF OF LIABILITY INSURANCE**

**ATTACHMENT 2:
SITE CONTROL**

December 18, 2017

Penelope Johnson
5 Hatfield Road
Haydenville, MA 01039

Dear Ms. Johnson,

This Letter of Intent (LOI) is intended to set for the basic terms under which Pro-Tech Energy Solutions, and its affiliates as proposed Lessee (hereinafter referred to as "Lessee") will lease from Penelope Johnson, as proposed Lessor (hereinafter referred to as "Lessor") a portion of the properties known as 5 Hatfield Rd, Haydenville, MA, on property map parcel ID# 340011K000000330, LS Book 3482, Page 290 and parcel ID# 34000&G000000761, LS Book 3690, LS page 313 as referenced in Appendix A (the "Leased Areas"). Final location of the solar array will be mutually agreed to by both parties and be in a location not visible from the residence situated on the subject's property..

The Purpose of the lease is for the installation of a photovoltaic generating facility (the "Generating Facility") on the Leased Areas in order to generate electric power for sale and distribution. It is understood that upon execution by both parties the LOI they shall precede towards the preparation and finalization of a Lease Agreement ("Lease"). The Lease, among other items, will provide additional details regarding schedule of projected approval submission times, installation, and maintenance of the Generating Facility and Leased Areas. Access to be solely through neighbor's property. No access may be from lessor's property and lessor has no responsibility for maintaining access to the equipment. The Lease will incorporate the terms of the Letter of Intent and will contain additional terms reflecting the structure of the transaction as well as customary representations, warranties, covenants, and conditions.

The basic terms of the transaction are as follows:

1. **Property.** The Leased Areas to be leased and upon which the Generating Facilities will be installed and operated consists of approximately 15-30 acres of that parcel(s) at the Leased Areas as described above and shown in Appendix A attached.
2. **Lease Agreement.** In order to permit the installation and operation of the Generating Facility on the Leased Areas, the Owner will enter into a Lease which will provide that during the Lease term, the lessee will have the right to enter and occupy all of the portions of the Leased Areas that is needed to install, operate to its maximum efficiency, maintain, replace and have access to the Generating Facility. In addition to such normal and customary terms for commercial land leases, the Lease shall contain such terms and conditions, supplemental to the LOI as reasonably required by Lessee in order for the Lessee to engage in the Generating Facility Activities and to assure that its occupancy of the Leased Areas is not disturbed for the duration of the Lease Agreement by Lessor or anyone acting on Lessor's behalf. It will be necessary, as a condition under the Lease, for the Lessor to obtain consent of any holder of any mortgage or security interest in the Property or any improvement constructed or installed thereon to a subordination and non-

disturbance agreement subordinating the priority of such mortgage or security interest to the interest of the Lessee in the Generating Facility so that (i) the generating Facility is considered the personal property of Lessee or its nominee, and shall survive any liens existing and related to the property to which the facility has utilized (ii) the Lessee will be permitted access to the property to remove the Generating Facility, at its' option, if the Lease is terminated or if the Property is foreclosed upon or title to the Property is otherwise transferred on terms and conditions reasonably acceptable to Lessor and security interest holder.

3. **Termination of LOI/Extension Option.** This LOI shall automatically terminate in the event that the parties hereto do not execute the contemplated lease within 12 months of the date of this LOI. However, in the event the parties have not executed the contemplated lease within 12 months, then, at the election of the Lessee and upon written notice of such election to the Lessor, the Lessee may extend the terms of this Letter of Intent for up to an additional 6 months provided that the Lessee pays to the Lessor [REDACTED] for each month of such extension. In the event the Lessor intends to exercise this Extension Option, Lessor shall notify Lessee, in writing of its intent to exercise such option at least 7 days prior to the expiration of this LOI (or prior extension then in effect) and, with such written notice, payment of the option payment of [REDACTED] reflected above. All Extension Option shall be nonrefundable.
4. **Lease Term and Rent.** The initial term of the Lease shall begin upon execution of the Lease and terminate twenty-five (25) years from Commercial Operation Date (COD as determined by the utility company) of the generating Facility, with three (3) renewable options (upon mutual agreement of Lessee and Lessor) of five (5) years each. Assuming the Lease is initiated by Lessee, Lessee's obligation to pay rent shall commence upon COD of the generating Facility or four (4) months from the commencement of the lease, whichever occurs first. If the Lessee has not exercised the Lease to the Leased Areas prior the expiration of this LOI, this LOI shall be void and of no further force and effect. Owner shall not be responsible for paying any commissions, charges, or fee in connection with the negotiation and entry into this LOI, and Lessee shall indemnify and hold Owner harmless from any commissions, fees, or charges arising from any real estate agent or broker involved in the transaction by its representation, contractors or its agents.
5. **Termination of Lease.** The term of the Lease shall include a reasonable period, not to exceed sixty days, to allow removal of the Generating Facility and cleanup of the real property, during which period Lessee shall not be charged rent, but shall pay taxes, insurance premiums and any other holding costs related to the Leased Areas.
6. **LOI Consideration.** As consideration for the terms of this LOI Lessee shall pay Lessor, the nonrefundable sum of [REDACTED] to bind the parties to the terms referenced herein.
7. **Lease Payment.** The Lessee shall pay Lessor, as lease payments, [REDACTED] per month during the construction and development phase (said timeframe not to exceed 4 months from the date the lease is executed) and, thereafter, no less than [REDACTED] per MW AC,

installed, with a 1% escalator per year, (the "Lease Rate"), payable annually, on or before January 1 of each year (said rent to be prorated and paid in advance from the date of the COD through the end of the initial year of the lease term).

The intent is to install a 3MW AC / 5MW AC solar array. All Payments shall be non-refundable.

The parties agree to negotiate the annual lease amount upon DOER releasing the final program details for the new FIT solar incentives. It is understood by both parties that the new incentives could adjust the lease upward or downward based on the economic realities of the program.

The Lease Rate also contemplates a total combined interconnection payment, as determined by the Utility Company of less than [REDACTED] per MW, should the interconnection payment exceed [REDACTED] per MW, the Lease Rate shall be decreased by [REDACTED] per MW AC for every [REDACTED] the interconnection payment exceeds [REDACTED] per MW

8. **Operation and Maintenance.** Lessee and its affiliates, at its sole cost and expense, will be solely responsible for designing, constructing, installing, operating, maintaining, replacing and upgrading the Generating Facility and land area subject to the lease during the term of the Lease. They will also comply with all required laws, rules and regulations (Laws) regarding such designing, contracting, installing, operating, maintaining, replacing, and upgrading the Generating Facility, including but not limited to compliance with any and all environmental, wildlife, health, safety, and energy generation laws. At the end of the lease term, Lessee shall return the Leased Areas to the Lessor in a clean condition and in substantially the same state as at the commencement of the Lease, except if and to the extent Lessor notifies Lessee that any improvements made to the Property shall remain on the Leased Areas (excluding any trade fixtures, which Lessor shall not be able to require Lessee to leave on the Leased Areas).
9. **Taxes.** Lessor shall pay all real property taxes levied against the Leased Areas for land only. During the Lease Term, Lessee will be responsible for payment of any increase in real property taxes or assessments as well as for any personal property tax or assessments caused solely by the construction of the Generating Facility. Lessee will also pay any back taxes associated with moving the property (solar property area only) out of 61A prior to solar construction. Lessor agrees to cooperate with any petition submitted by Lessee pursuant to M.G.L. c.59, §38H (Acts of 1997 Chapter 164, Section 71(b), as amended) seeking a tax payment agreement with the Town of Haydenville.
10. **Maintenance of Leased Areas.** During the Option Term, Lessor will maintain the Property in its present undeveloped condition as it is as of the date of execution of this LOI and, in the event the Option is exercised and the Lease executed, in its condition as of the date of execution of the Lease. Lessor shall pay all real property taxes and assessments before any of the same becomes delinquent.

11. **Financing Approvals.** Lessee's obligation under the LOI and the lease will be expressly conditioned upon its ability to obtain all financing to construct the Generating Facility on the Leased Areas.
12. **Insurance and Indemnification.** Lessee or its agents shall, at its own expense, maintain a commercial general liability insurance policy in an amount not less than [REDACTED] in combined single limit liability insurance coverage per occurrence, which coverage limit shall be reviewed and increased to correspond to market changes every five years during the lease term. Lessor shall be an insured under said policy. Lessee shall furnish the Lessor with a certificate of insurance prior to entry onto the Property. Lessee shall indemnify and hold harmless Lessor from any and all liabilities, claims, costs (including reasonable attorney's fees) expenses, actions, and penalties (collectively, Claims) arising from its actions and inactions or attributable to them at any time, in and around the Leased Areas, and for any Claims arising during the Lease term, except if and to the extent due to the gross negligence or intentional wrongdoing of Lessor. This indemnity obligation shall survive any termination of the LOI or Lease.
13. **Exclusivity.** Lessor hereby agrees that Lessor will not negotiate with any party regarding the sale or lease of the Property so long as Lessee is pursuing its rights hereunder in a timely manner and the LOI has not been terminated, recognizing that this LOI is binding upon Lessee and the Lessor.
14. **Confidentiality.** Both parties of this LOI acknowledge that they are bound by a confidentially agreement that protects the confidentiality of information provided by each other and the disclosure of the terms of the LOI.
15. **Negotiation of the Option and Lease.** Both parties to the LOI shall negotiate the Lease in good faith and may each terminate the LOI only, if exercising in good faith, they are not able to agree upon the terms of the Lease within 180 days of this date. A draft of the Lease Agreement shall be furnished to the Lessee within 30 days of the execution of this LOI by all parties.
16. **Limited Binding Effect.** Both parties agree that this LOI contains sufficient terms and conditions regarding the subject matter of this LOI to be considered a binding agreement between the parties, recognizing that the Lease will contain additional provisions and terms, and subject to the termination of this LOI as provided herein.
17. **Tree Removal.** Lessee will use reasonable efforts to construct any solar array on adjacent property in a manner that minimizews visual impact from landowners' home. Lessee shall pay to landowner any payment received related to harvestable timber on Landowner's property, net of any applicable expenses. Lessee will consult with landowner prior to commencing any tree removal on Lessor's property

*[The remainder of this page has been intentionally left blank.
Signatures appear on next page]*

Richard Cooper

Rich Cooper, CEO
Pro-Tech Energy Solutions

Date: _____

Accepted by Lessor

Signature: Penelope D. Johnson

Date: 12/19/17

Name: PENELOPE D. JOHNSON

Title: the Landowner

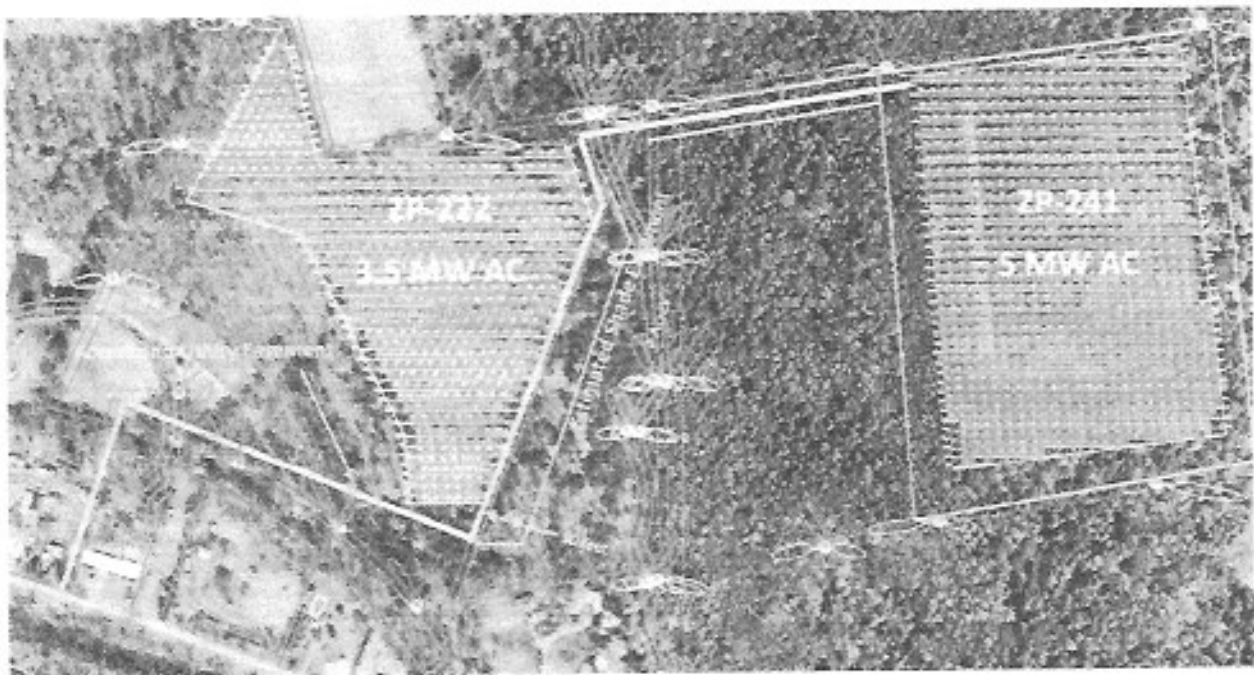
Signature: _____

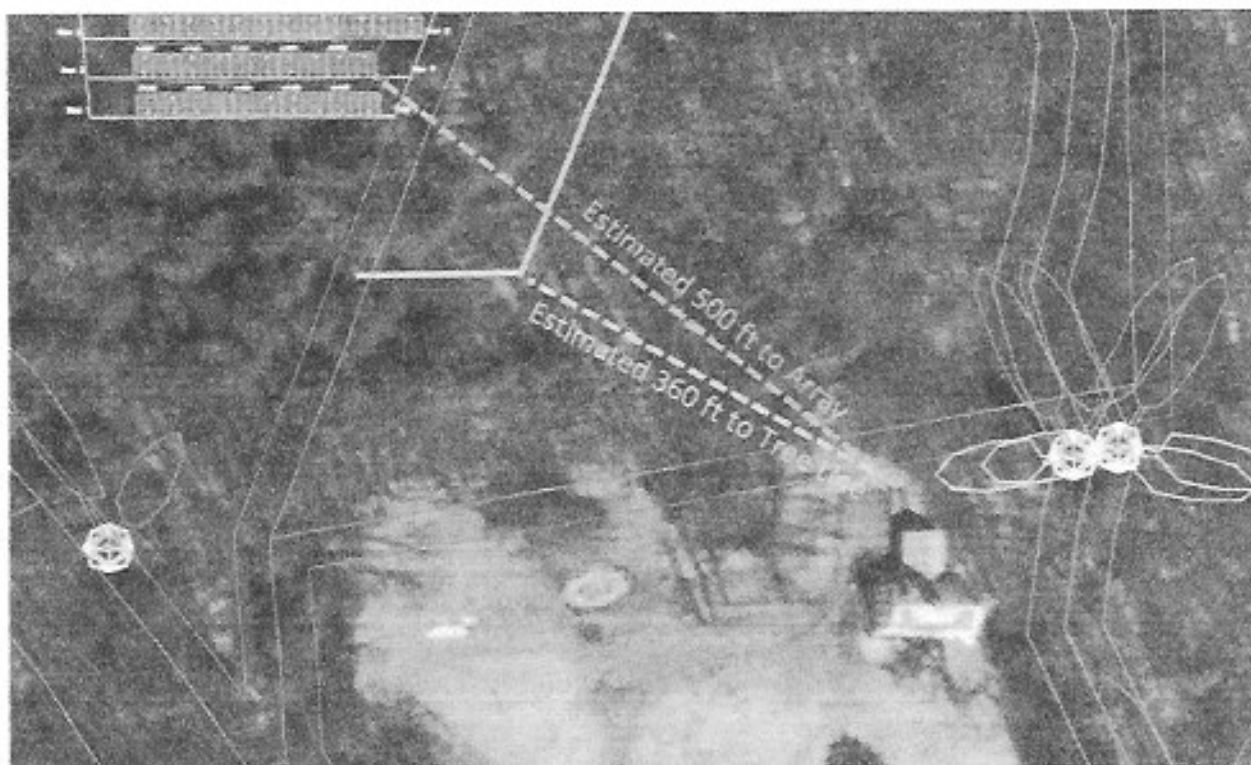
Date: _____

Name: _____

Title: _____

Appendix A – Proposed PV Location





RA Inwood, assessed Utility Easement
including 20 foot wide gravel access driveway





December 5, 2018

Ms. Penelope Johnson
5 Hatfield Road
Haydenville, MA 01039

Re: 1st Extension of Letter of Intent for Hatfield Road Solar Project

Dear Ms. Johnson:

Reference is made to the Letter of Intent dated December 18, 2017, between Penelope Johnson ("Lessor") and Pro-Tech Energy Solutions ("Lessee").

On behalf of the Lessee, we are writing today to inform you that we will be extending the letter of Intent by 3 (three) months at the rate of [REDACTED] per month. This will extend the Letter of Intent to March 18, 2019.

Best regards,


Richard Cooper
President & CEO

office: (856) 437-6220
fax: (856) 437-6501
215 Executive Drive
Moorestown, NJ 08057

protechenergysolutions.com

**ATTACHMENT 3:
UTILITY NOTIFICATION**

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application**Contact Information (TYPE or PRINT):**Date Prepared: 11.2.2017Legal Name and Address of Interconnecting CustomerInterconnecting Customer: ZPT Energy Solutions II, LLC Contact Person: Greg Hunt/ Chad BoninMailing Address: 6 Park Ave. Suite 100City: Worcester State: MA Zip Code: 01605Telephone (Daytime): 617-823-6169 / 774-479-9860 (Evening): SameFacsimile Number: _____ E-Mail Address: ghunt@zpeenergy / cbonin@zpeenergy.comOwnership Information (include % ownership by any electric utility): 100% ZPT Energy Solutions II, LLCSite Control: Does the Interconnecting Customer have site control? Yes NoConfidentiality 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 NoGroup 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 NoHost 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): Penelope JohnsonLandowner email: pdj1@nyu.edu Landowner telephone: 413-320-6988Landowner Mailing Address: 5 Hatfield St.City: Haydenville (Williamsburg) State: MA Zip Code: 01039Alternative Contact Information (e.g., system installation contractor or coordinating company, if appropriate):

Company Name: _____ Contact Person: _____

Mailing Address: _____

City: _____ State: _____ Zip Code: _____

Telephone (Daytime): _____ (Evening): _____

Facsimile Number: _____ E-Mail Address: _____

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 NoInterconnection 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: 5 HatfieldCity: Haydenville (Williamsburg) State: MA Zip Code: 01039Single 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: 7770573028 Meter Number: _____Work Request Number (For Upgrades or New Service): 25266378 MTC ID: _____System Size Capacity: Nominal 1600 (kWac) 1600 (kVA) Maximum 1600 (kWac) 1600 (kVA)Massachusetts: http://www.nationalgridus.com/masselectric/home/energyeff/distributed_generation.aspNantucket: http://www.nationalgridus.com/nantucket/home/energyeff/distributed_generation.asp

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application

For Solar PV provide the DC-STC rating: _____ (kW_{DC})
2240

Prime Mover: Photovoltaic Reciprocating Engine Fuel Cell Turbine Other: _____
Energy Source: Solar Wind Hydro Diesel Natural Gas Fuel Oil Other: Battery Storage DC side connected
IEEE 1547.1 (UL 1741) Listed? Yes No

1) Generating Unit Type 1
Manufacturer: GP Tech Model Name and Number: MP2800WD3-HV690 Quantity: 1
AC Rating:
Nominal: 1600 (kW) : 1600 (kVA) : 690 (AC Volts)
Maximum: 1600 (kW) 1600 (kVA) 690 (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: Housing Authority
Export Form? Qualifying Facility (QF) Net Metering Other (explain): _____
Estimated Install Date: 3/15/2018 Estimated. In-Service Date: 3/30/2018
Agreement Need By: 12/30/2018

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: Manager Date: 11.2.2017

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: _____

Exhibit C - Generating Facility Expedited/Standard Process Interconnection Application

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.	Inverter	GP TECH	MP2800WD3-HV690	UL1741
2.	Inverter	GP TECH	MP2800WD3-HV690	UL 1741
3.	Solar Panel	LG	LG365 N2W	UL1703
4.	MV Transformer	Cooper	Tamper Proof Distribution Type	ANSI C57.12 NEMA TR 1-1993 (R2000)
5.	Protective relay	SEL	651R	
6.	Vacuum Fault Interrupter	Tavrida	OSM25-A1-2(630-150)	

Total Number of Generating Units in Facility? 2

Generator Unit Power Factor Rating: >99%

Max Adjustable Leading Power Factor? -.88 Max Adjustable Lagging Power Factor? +.88

Generator Characteristic Data (for all inverter-based machines)

Max Design Fault Contribution Current? 76.98amps Instantaneous or RMS

Harmonics Characteristics: <3%

Start-up power requirements: <400W

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: 11.2.2017

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: 1600 (kVA) Single or Three Phase

Transformer Impedance: 4 (%) on a 1600 kVA Base

If Three Phase:

Transformer Primary: 13.2k (Volts) Delta Wye Wye-Grounded Other: WYE-Impedance

Transformer Secondary: 690 (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: Cooper Power Systems Type: PRCLF=3544125M71M and Bayonet = 4038108C14. Under Oil

Size: See Datasheet Speed: See Datasheet

Interconnecting Circuit Breaker (if applicable):

Manufacturer: ABB Type: 100% Rated Brkr Load Rating: 1600 (Amps)

Interrupting Rating: 42kA Trip Speed: programmable (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.	See Drawing and Datasheet	_____	_____
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

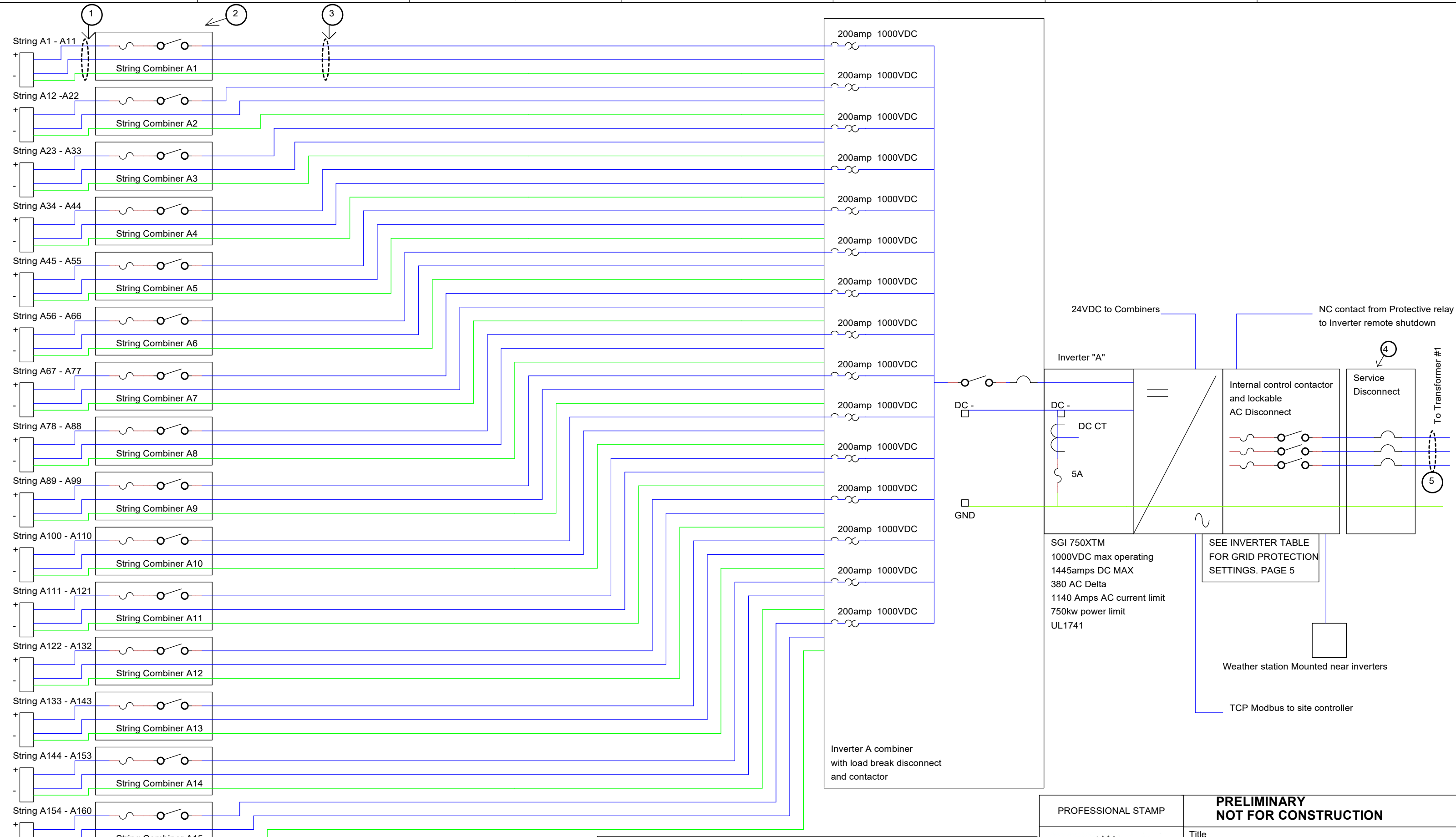
Commercial: http://www.nationalgridus.com/masselectric/business/energyeff/distributed_generation.asp

Nantucket:

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

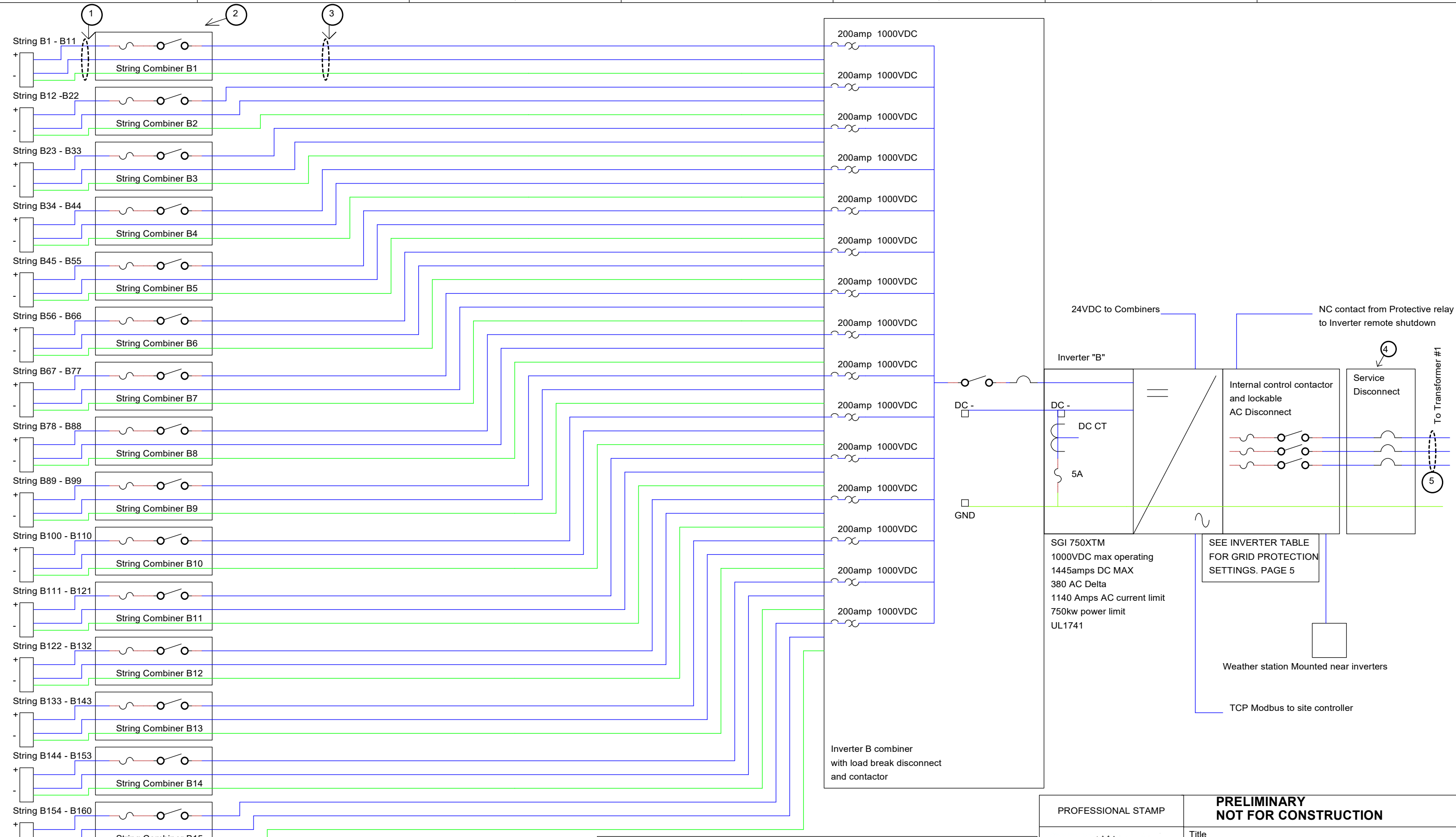
Commercial: http://www.nationalgridus.com/nantucket/business/energyeff/distributed_generation.asp

**ATTACHMENT 4:
ELECTRICAL DIAGRAM**



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Inverter B combiner with load break disconnect and contactor

SGI 750XTM
 1000VDC max operating
 1445amps DC MAX
 380 AC Delta
 1140 Amps AC current limit
 750kw power limit
 UL1741

SEE INVERTER TABLE FOR GRID PROTECTION SETTINGS. PAGE 5

Weather station Mounted near inverters

TCP Modbus to site controller

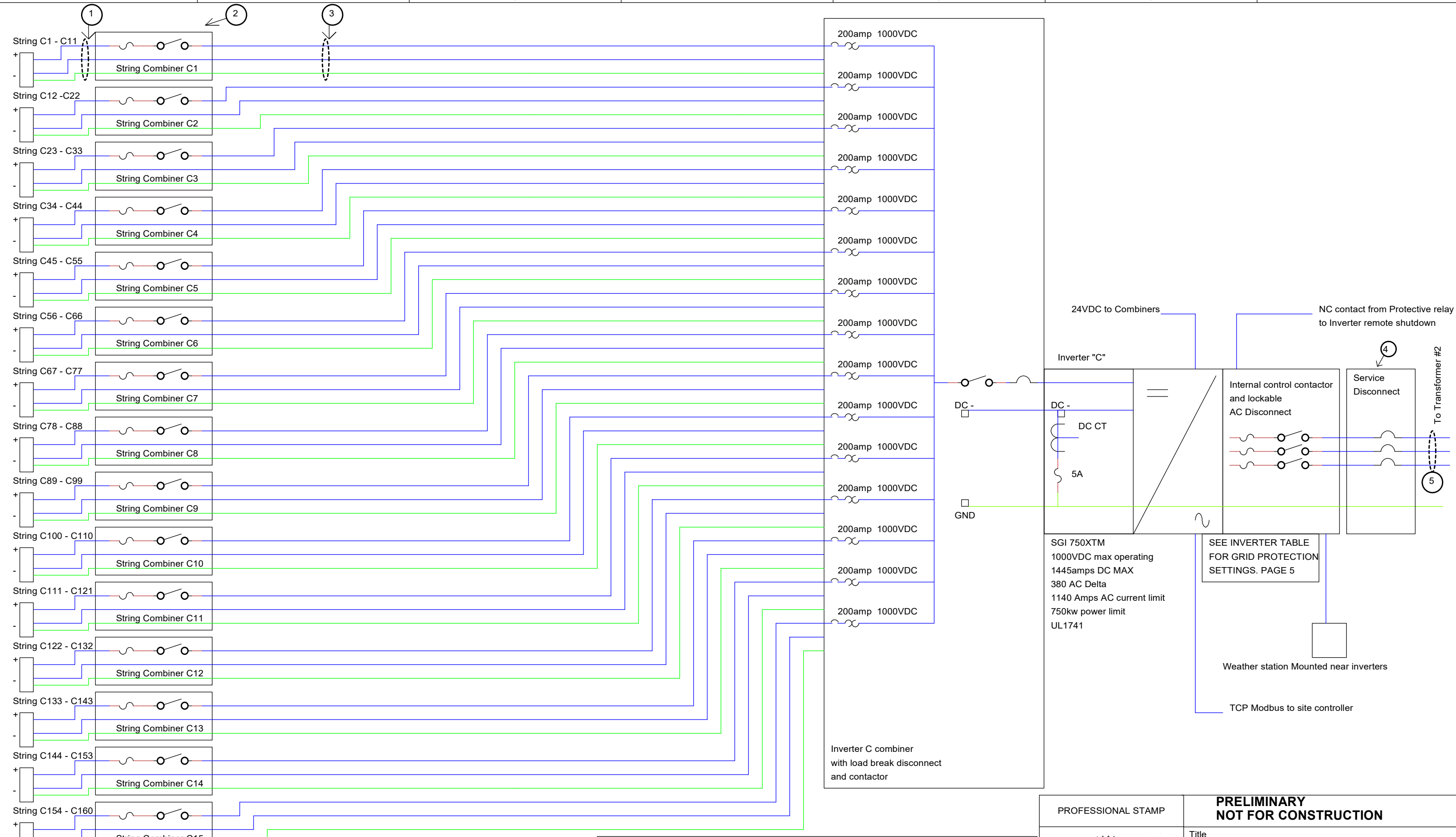
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Inverter C combiner
with load break disconnect
and contactor

SGI 750XTM
1000VDC max operating
1445amps DC MAX
380 AC Delta
1140 Amps AC current limit
750kw power limit
UL1741

SEE INVERTER TABLE
FOR GRID PROTECTION
SETTINGS. PAGE 5

Weather station Mounted near inverters

TCP Modbus to site controller

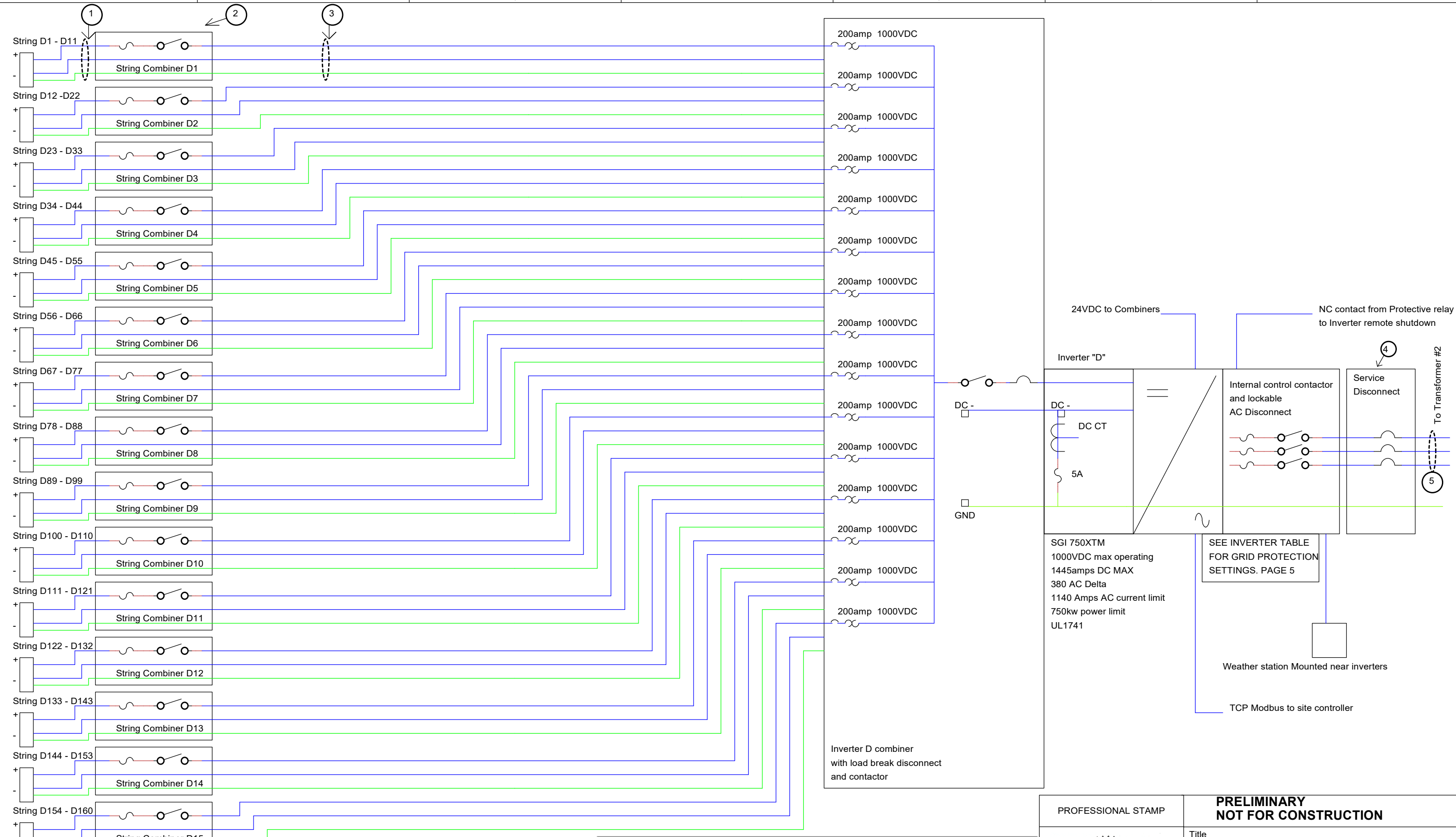
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Inverter D combiner with load break disconnect and contactor

SGI 750XTM
 1000VDC max operating
 1445amps DC MAX
 380 AC Delta
 1140 Amps AC current limit
 750kw power limit
 UL1741

SEE INVERTER TABLE FOR GRID PROTECTION SETTINGS. PAGE 5

Weather station Mounted near inverters

TCP Modbus to site controller

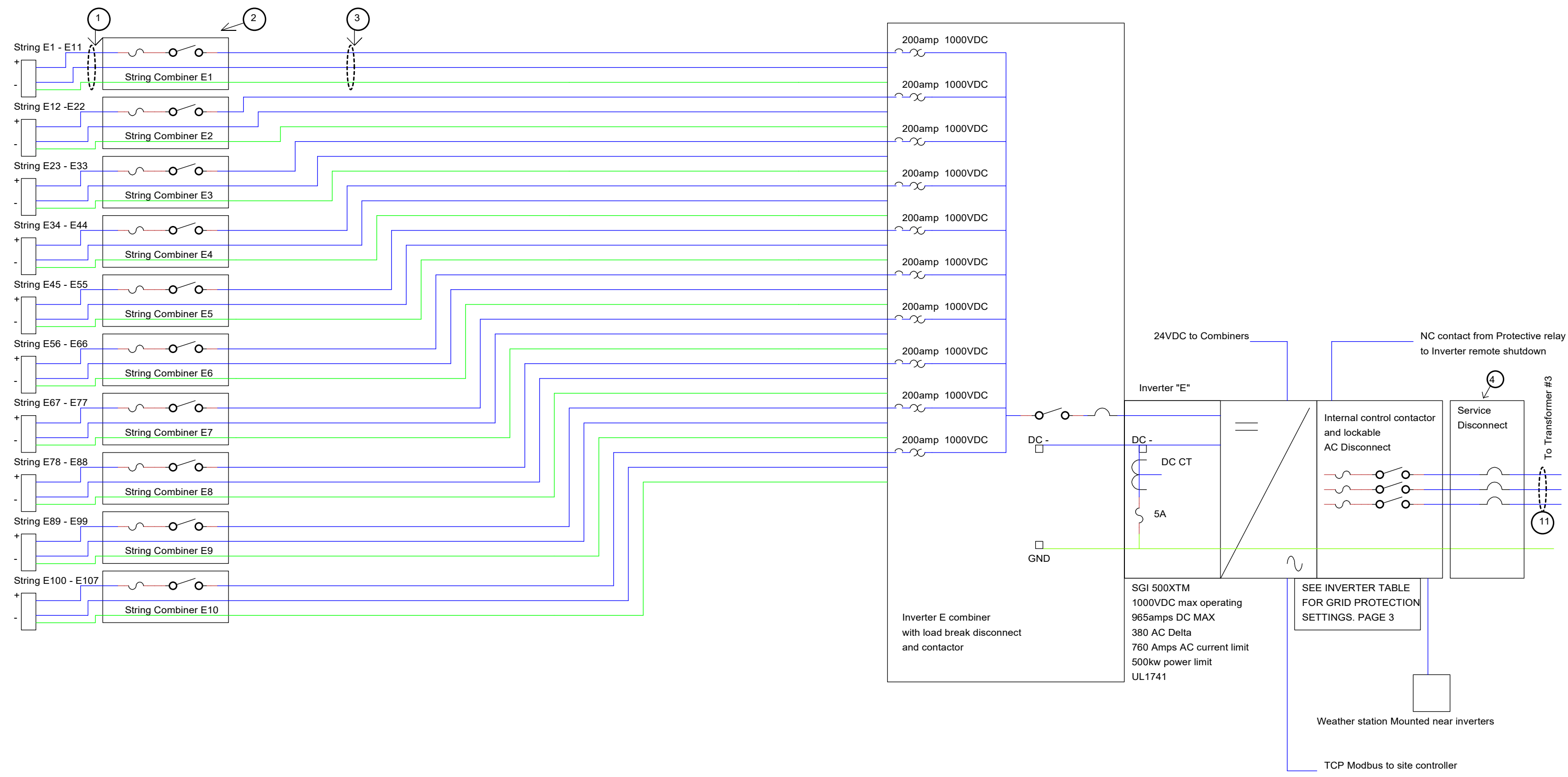
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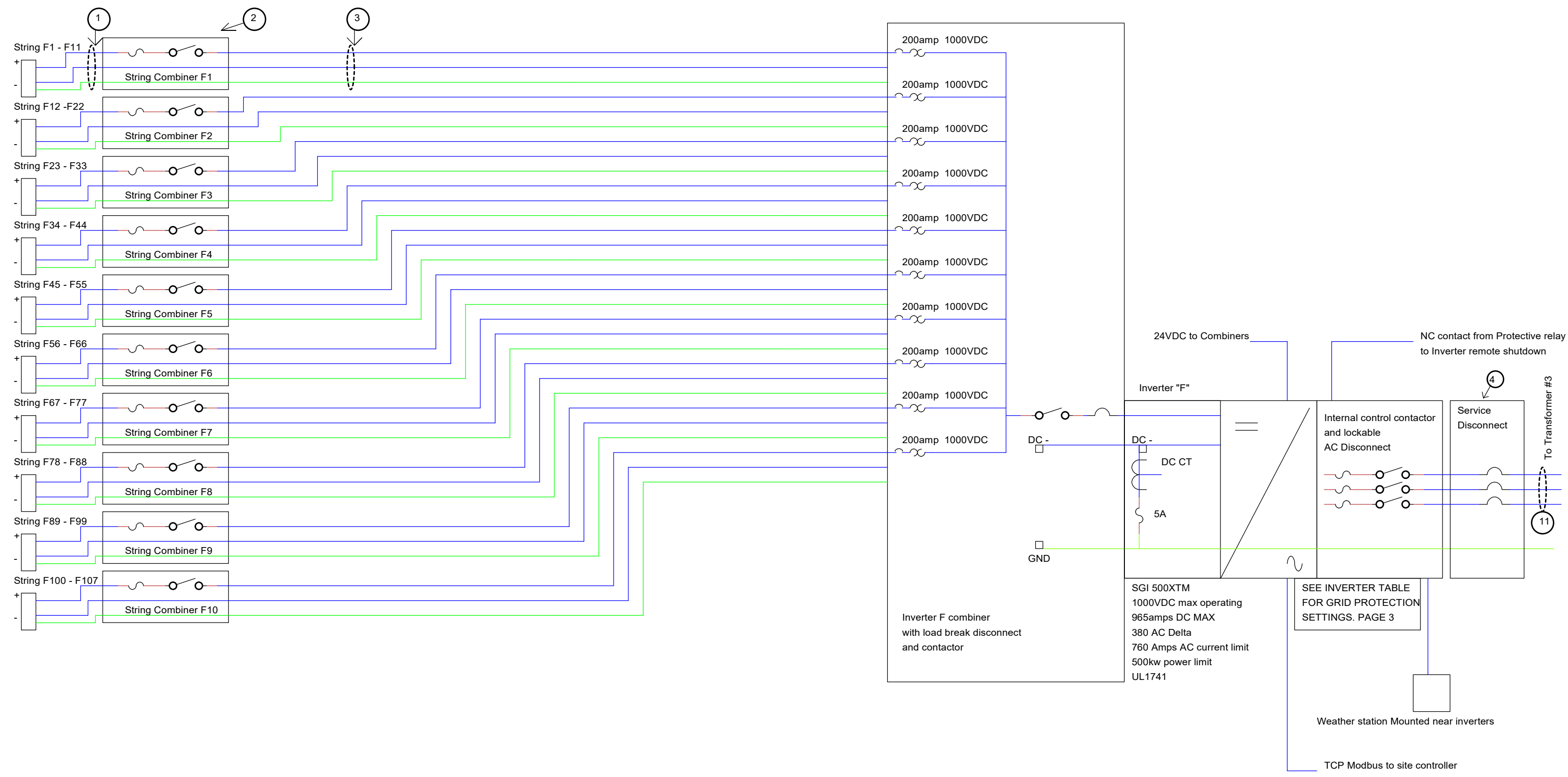
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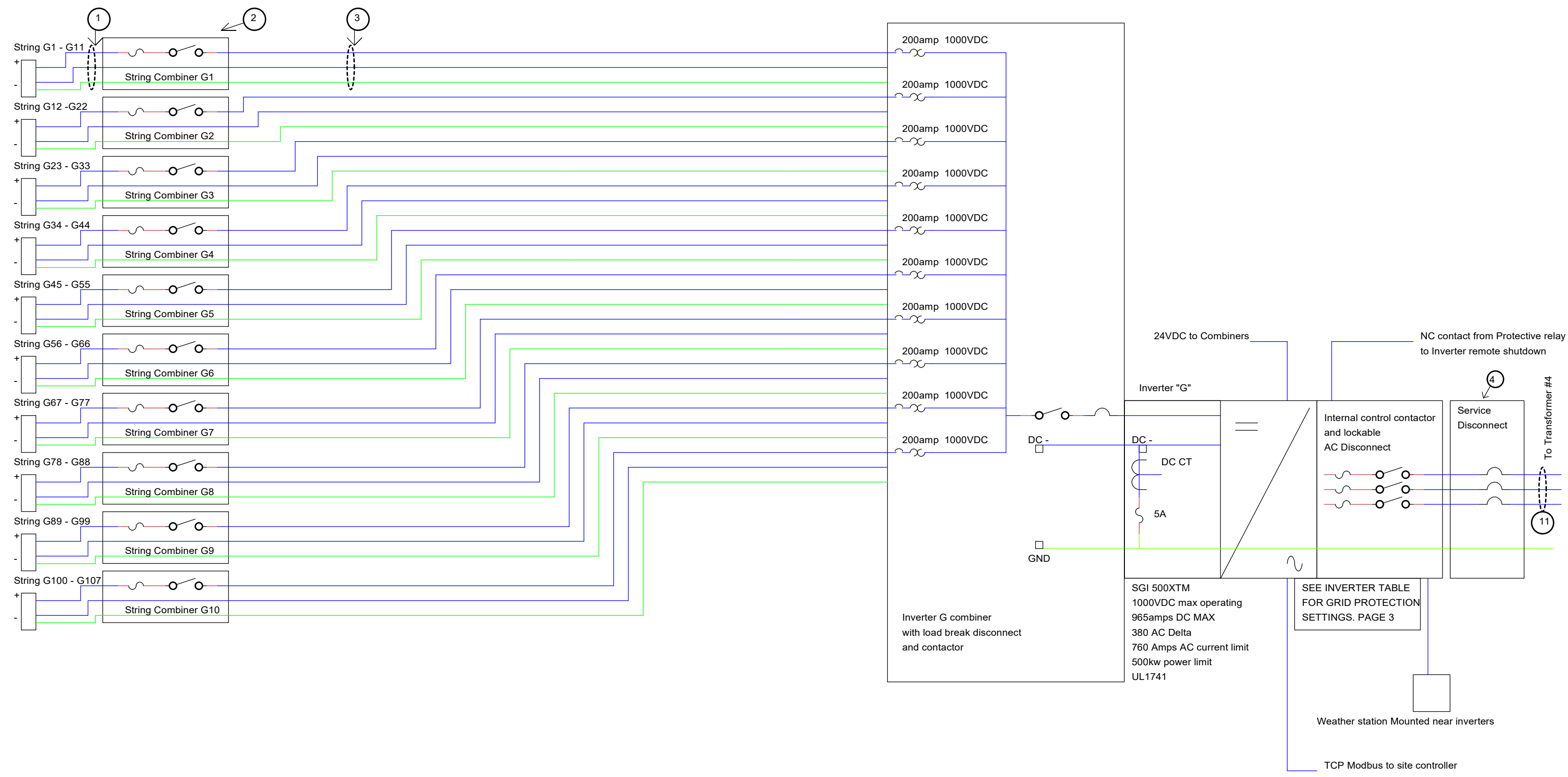
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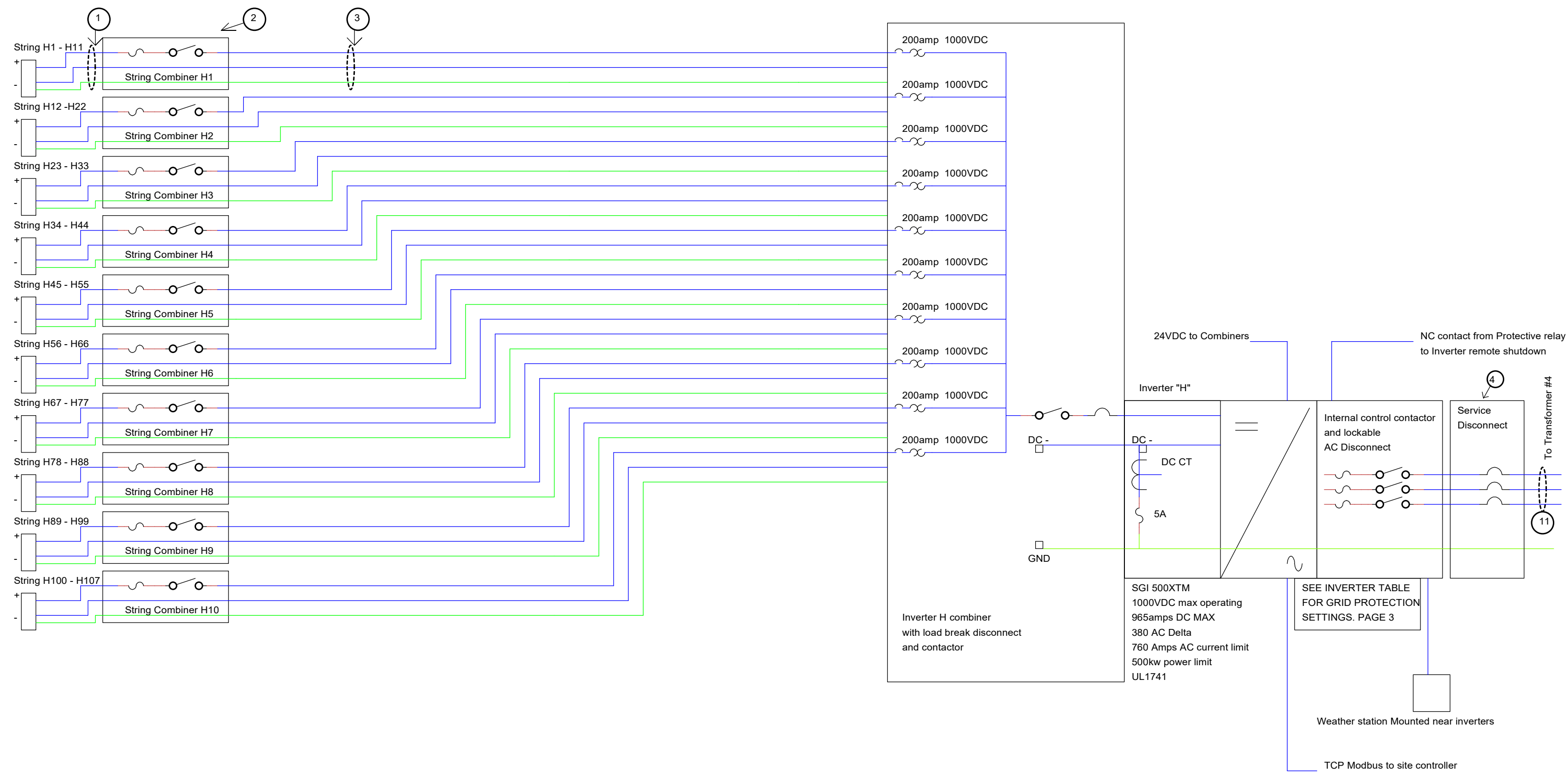
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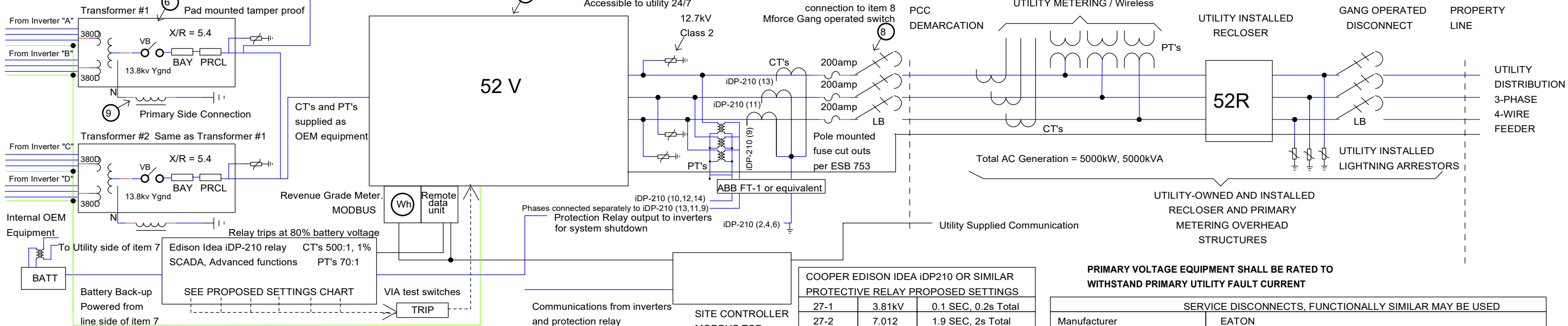
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[10C5] To Transformer #3,4 x-y impedance > 10% on 750kVA base



GROUNDING CONDUCTORS TO BE INSTALLED PER MEC ARTICLE 250 AND 690

INVERTER INFORMATION	
Manufacturer	Solectria
Model Number	SGI 500XTM
Operating Voltage	545 - 1000
Mpp Voltage Range	545 - 820
Max Continuous Power	500kW/750kW
Max VOC	1000
Max Operating Input Current	965 / 1445
AC Nominal Voltage	380 L-L
Operatin AC Voltage Range	+10% -12%
Max Rated Output Current	760 / 1140
Total Harmonic Distortion	< 3%
Power Factor	> 99%
CEC Efficiency	98%
Grid Protection	UL 1741
Strings Per Inverter	140 MAX
Combiner Inputs	15
Combiner Fuses	200amps
Max Strings Per Fuse	13
PROTECTION SETTINGS	
Reconnect Low Frequency	59.95hz
Reconnect High Frequency	60.05hz
over frequency	61.0hz,300s
over frequency 2	62.0hz,0.16s
under frequency	57hz, 0.16s
under frequency 2	58.5hz, 100s
over current	1.25kA/ph
voltage imbalance	38V
over voltage instantaneous	532V
over voltage fast	456V, 0.16s
over voltage slow	418V, 1s
under voltage instantaneous	38V
under voltage fast	190V, 0.16s
under voltage slow	334.4V 2s
Ground fault trip	5 amps
Voltage and Frequency Ride Through Disabled	

PV STRING INFORMATION	
Number of Module In Series	18
STC Power per String	6,570.00 W
STC VOC at -20C	988.8
Vmpp at 39C	583.7
Imp STC	9.46
Isc STC	9.89

PV MODULE AND ARRAY INFORMATION	
Module Manufacturer	LG
Module Model Number	LG365 N2W
Max Power	365W
VOC at -20C	54.94
Vmpp	38.6
Imp	9.46
Isc	9.89
Max Series Fuse	20 amp
Total Array DC STC	7016.76kWp

NEUTRAL REACTOR IS A PLACE HOLDER. UTILITY WILL DETERMINE IF THIS IS A REQUIREMENT AND WILL SPECIFY THE REQUIRED PARAMETERS.

COOPER EDISON IDEA iDP210 OR SIMILAR PROTECTIVE RELAY PROPOSED SETTINGS		
27-1	3.81kV	0.1 SEC, 0.2s Total
27-2	7.012	1.9 SEC, 2s Total
51N	899A	0.9 SEC, 1s Total
51-phase	314A	2.2 SEC U.S. TCC U4
59-1	8.383kV	0.6 SEC, 0.7s Total
59-2	9.145kV	0.1 SEC, 0.2s Total
81U-1	57	0.1 SEC, 0.2s Total
81U-2	58.5	100 SEC, 100.1s Total
81O	60.5	0.1SEC, 0.2s Total
51C-ph	60A 91V	2.0 U.S. TCC U4
51C/N	48A	0.5 U4, V=80%
59N	100V	1.9 SEC, 2s Total
See note 5		


SERVICE DISCONNECTS, FUNCTIONALLY SIMILAR MAY BE USED	
Manufacturer	EATON
Main Device	CUTLER-HAMMER TYPE "CRD" 100% RATED VISA TYPE BRKR
Frame	1000A 3P / 1500A 3P
Trip Unit	DIGITRIP RMS310 LSI
Fuse Provision	NONE
Rating Plug	800A / 1200A
Main Bus Rating	1000 amp / 1500 amp, 480 volts, 60 hz
Grounding	Remote Upstream
SWBD CCT RATING	50 KA SYM
BUS Bracing	50 KA SYM
Ground Fault Protection	NONE
Suitable for Service Use	YES
Enclosure Type	3R (NONWALK-IN)
Certifications	UL / CSA, Service entrance rated

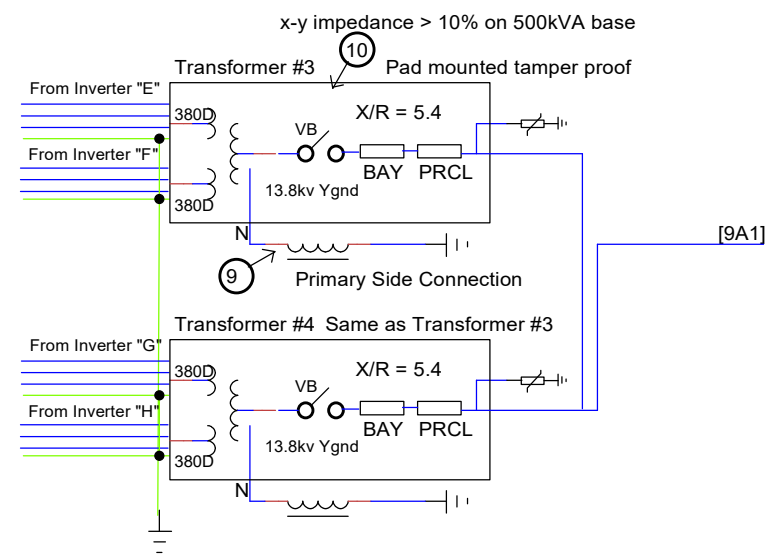
NUMBERED DRAWING ITEMS		
1	10awg with MC4 connectors per string from panels to string combiner. Type "USE-2" 90C outdoor rated. Max length 1000ft. Minimum length 10ft	FUNCTIONALLY SIMILAR MAY BE USED
2	Field combiner. 16 input, 15 amp fuses Solectria ARCCOM 24. UL1741 rated Input wire range 14 to 6 awg. NEMA 4. Output wire range (2) 1awg - 600kcmil Max current 192amps. Load break rated lockable disconnect. Integrated arc fault detection and shutdown.	
3	Home runs based on 152amp max current. 300kcmil per pole, based on 3 conduit buried electrical duct bank per MEC 2014 figure B.310.15 (B)(2)(2) detail 2. Type UF 90C in under ground plastic conduit, SCH 80 PVC, 28% fill including ground conductor. 1200ft max length	FUNCTIONALLY SIMILAR MAY BE USED
4	See Service Disconnects Table	
5	Cables from inverter to transformer LV. 6 x 600kcmil per phase. 90C 600vac.	FUNCTIONALLY SIMILAR MAY BE USED
6	Distribution type pad-mounted transformer. Tamper proof. Designed for Step-up operation. 1500kva, 3-winding, LHL, 5 leg core. KNAN cooling class. 60C rise. ANSI C57.12.34 and C57.12.28. NEMA TR-1 sound level. LV BIL 30KV. MV BIL 95KV. UL listed. Guages, sample port and visible load break disconnect accessible without opening termination cabinet. 4% Minimum impedance H-X and H-Y 750kva base. Target impedance 5%. Efficiency >99% CEC weighted. Dead-Front Loop fed, 600amp. Primary taps 2 x +/- 2.5%. Fault current limited to 20kA by PRCL "Zero Forcing" Fuse in transformer. Has fully rated Insulated neutral bushing per ESB 756 C 5.5.3.1	
7	15 kV 3 Phase Vacuum Fault Interrupter (VFI) Pad-Mounted Switchgear. Cooper Model 5 - 2 Way Part Number KP00610L01S09M. Single sided dead-front. Front-mounted front-operated switch, trip-free operation. Housing protective relay and all associated PT's, CT's, communication and power supply transformer. 12.5kA break, 600amp, 15.5kV, 95kV bil, clearing time 0.1s	FUNCTIONALLY SIMILAR MAY BE USED
8	Cooper K-SEC 926 gang operated M-force disconnect switch. 15kv distribution class with ice shields. Max Voltage 17kv BIL 110kv CONTINUOUS CURRENT 600A LOAD BREAK, 50@600A, 10@900A MOMENTARY 40 kA Asy. rms 3 SECOND, 25 kA Sym. rms FAULT CLOSE (ASYM) 1 @ 20 kA, 3 @ 15 kA	
9	20 Ohm Neutral reactor PQI Global Services / RMCLARK assoc. Voltage Class 15kV BIL 95kV Continuous Current 100amps Bracing 2000amps for 2 seconds Aluminum Windings Max rise 150C NEMA 3R enclosure Bottom feed Pad Mounted	FUNCTIONALLY SIMILAR MAY BE USED
10	Distribution type pad-mounted transformer. Tamper proof. Designed for Step-up operation. 1000kva, 3-winding, LHL, 5 leg core. KNAN cooling class. 60C rise. ANSI C57.12.34 and C57.12.28. NEMA TR-1 sound level. LV BIL 30KV. MV BIL 95KV. UL listed. Guages, sample port and visible load break disconnect accessible without opening termination cabinet. 4% Minimum impedance H-X and H-Y 500kVa vase. Target impedance 5%. Efficiency >99% CEC weighted. Dead-Front Loop fed, 600amp. Primary taps 2 x +/- 2.5%. Fault current limited to 20kA by PRCL "Zero Forcing" Fuse in transformer. Has fully rated Insulated neutral bushing per ESB 756 C 5.5.3.1	

NOTES

- 1). CONDUCTOR SIZES SHOWN ARE FOR COPPER CONDUCTORS UNLESS NOTED OTHERWISE.
- 2). INSTALLATION SHALL BE PERFORMED IN ACCORDANCE WITH THE LATEST REVISION OF THE NATIONAL ELECTRIC CODE NEC2017 AND MASSACHUSETTS AMENDMENTS
- 3). USE IRREVERSIBLE COMPRESSION CONNECTORS TO BOND GROUND WIRES
- 4). LABEL EQUIPMENT AND CONDUCTORS PER MEC REQUIREMENTS
- 5). PER ESB756C A RELAY ALARM CONTACT SHALL BE INCLUDED WIRED TO TRIP THE GENERATOR WHEN THE RELAY FAILS, IS NOT IN SERVICE, OR SUPPLY VOLTAGE TO THE RELAY IS LOST. THERE SHALL BE A 2 SECOND TIME DELAY IN TRIPPING ANSI 62

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11 Cables from inverter to transformer LV. 3 x 700kcmil per phase. 90C 600vac.

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**ATTACHMENT 5:
OPERATION AND MAINTENANCE**

**OPERATIONS &
MAINTENANCE PLAN**
Ground-Mounted Solar Project
at
5 & 5R Hatfield Road
Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

1.1 OPERATION & MAINTENANCE ANNUAL SCHEDULE

Task	Schedule
Full Site Visual Inspection & Report	Quarterly
Production Performance Report	Quarterly
Inverter Preventative Maintenance	Annually
Medium Voltage Gear Maintenance	Annually
String Voc/Imp	100%, Annually
IV Curve Tracing	100%, Annually
Thermal Imaging Combiners, Inverters, Disconnects	100%, Annually
Warranty Enforcement	4
Issue Tracking of Unscheduled Service Dispatches	4
24/7 Monitoring	4
Dispatch Commitment	48 hrs.
Three (3) Corrective Maintenance Troubleshooting Dispatches (total of 24 hrs.)	Annually
Vegetation Management	As needed

1.2 EXHIBIT A – SYSTEM SERVICES

1.2.1 SYSTEM SERVICES FOR YEARS 1 – 10

PREVENTIVE MAINTENANCE SITE VISITS

One time, annually, additional at request and expense of Project Owner for:

- System testing (voltage/amperage)
- System visual inspection and necessary corrections, excluding cost of replacement components:
- Inspect for stolen, broken or damaged PV modules, record damage and location. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer’s Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner
- Inspect PV wiring for loose connections and wire condition. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer’s Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect for wires in contact with the structure or hanging loose from racking. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract

- or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check mechanical attachment of the PV modules to the racking. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Check attachment of racking components to each other and the structure. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Verify proper system grounding is in place from panels to the inverter. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Check conduits and raceways for proper anchorage to structures. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect all metallic parts for corrosion. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Check combiner boxes for proper fuse size and continuity. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect all wiring connection for signs of poor contact at terminals (burning, discoloration, etc.). Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect disconnection for proper operation. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Survey entire jobsite for debris or obstructions. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project

- Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect fasteners for proper torque and corrosion. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect inverter pad for cracking or settling. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect electrical hardware for proper warning and rating labeling. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Review as built documentation as needed and update as built documentation as changes are required.
 - Inspect alignment of arrays and racking to identify settling foundation or loose attachments. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect operation of tracking hinges, pivots, motors and actuators if present. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Check proper operation and reporting of monitoring hardware. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect sealed electrical components for condensation buildup. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
 - Inspect wiring and hardware for signs of damage from vandalism or animal damage. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.

- Routine system maintenance to include correction of loose electrical connections, ground connections, replacement of defective modules found during testing, other minor maintenance repair work. Tree trimming, and plant trimming work not included.
- Routine DAS maintenance to include sensor calibration and data integrity check.

TROUBLESHOOTING, INSPECTION AND ADDITIONAL REPAIRS

- Dispatch of field services resources within two business days for repairs up to three times per year or as deemed necessary by Operator.
- Major system repairs, not to include mid-voltage switchgear or transformers.

CUSTOMER SERVICE SUPPORT

Support line is available to Project Owner staff to answer questions or report issues.

MAJOR COMPONENTS

Operator will represent Project Owner on all major component issues.

REPORTING

- Monthly Production report will be available online to the Project Owner personnel.
- Annual Performance report will be sent electronically to the Project Owner personnel.
- O&M Manual updates. Complete versions of new editions to be delivered electronically to the Project Owner staff as they become available.
- As Built drawing updates, as necessary.

OTHER SYSTEM SERVICES

Facility staff training, one time per site which will include the follow basic training items:

- General Inspection: A full visual and physical inspection of all systems components and their immediate surroundings carried out in accordance with inspection checklists.
- Safety: Operator will train Project Owner staff on how to safely shut down the system.
- Tree Trimming/Plant Trimming: Operator will train Project Owner staff on what vegetation near structures that need to be trimmed as required by local site conditions.
- Structure Maintenance: Necessary preventive maintenance may be performed on system structural components to ensure continued safe and effective operation.
- The basics of performing a visual inspection: Checklist review with Operator.
- Performance characterization, as determined by Operator.
- O&M Manuals – additional copies, as needed. Updated editions of O&M manuals will be sent electronically to the Project Owner as they become available.
- Management of long-term service and warranty agreements, ongoing. Operator shall provide Project Owner local DFD/AFSD with updates as required.

INVERTER REPAIR

Component replacement and refurbishment as required, in the event of a failure.

INVERTER INSPECTION AND REGULAR SERVICING

As required under inverter manufacturer's warranty specifications. Include but are not limited to the following, one time annually:

- Check appearance/cleanliness of the cabinet, ventilation system and all exposed surfaces.
- Inspect, clean/replace air filter elements.
- Check for corrosion on all terminals, cables and enclosure.
- Check all fuses.
- Perform a complete visual inspection of all internally mounted equipment including subassemblies, wiring harness, contractors, power supplies and all major components.
- Check condition of all the AC and DC surge suppressors.
- Torque terminals and all fasteners in electrical power connections.
- Check the operation of all safety devices (E-stop, door switches)
- Record all operating voltages and current readings via the front display panel.
- Record all inspections completed.
- Inform Manufacturer of all deficiencies identified.
- Manufacturer will be responsible for the In-Warranty replacement of failed inverter components, parts and labor.

SERVICES UNDER THE FOLLOWING WARRANTIES

- 20-year warranty for inverters as set forth in Exhibit F of the EPC Contract.
- 25-year warranty for PV Modules as set forth in Exhibit F of the EPC Contract.

EDUCATION PROGRAM

Operator will work with the Project Owner to provide the following education program one time annually, per site:

- Assistance with development of solar class lesson plans.
- Assistance developing multimedia, social networking tools, and videos.
- Classroom and assembly presentations. Assistance with public education campaigns, activities and workshops surrounding Earth Day and Earth Month community events, outreach, and initiatives.

1.2.2 SYSTEM SERVICES FOR YEARS 11 – 20

PREVENTIVE MAINTENANCE SITE VISITS

One time, annually, additional at request and expense of Project Owner for:

- System testing (voltage/amperage)
- System visual inspection and necessary corrections, excluding cost of replacement components:
- Inspect for stolen, broken or damaged PV modules, record damage and location. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner
- Inspect PV wiring for loose connections and wire condition. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.

- Inspect for wires in contact with the structure or hanging loose from racking. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check mechanical attachment of the PV modules to the racking. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check attachment of racking components to each other and the structure. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Verify proper system grounding is in place from panels to the inverter. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check conduits and raceways for proper anchorage to structures. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect all metallic parts for corrosion. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check combiner boxes for proper fuse size and continuity. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect all wiring connection for signs of poor contact at terminals (burning, discoloration, etc.). Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect disconnection for proper operation. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.

- Survey entire jobsite for debris or obstructions. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect fasteners for proper torque and corrosion. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect inverter pad for cracking or settling. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect electrical hardware for proper warning and rating labeling. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Review as built documentation as needed and update as built documentation as changes are required.
- Inspect alignment of arrays and racking to identify settling foundation or loose attachments. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect operation of tracking hinges, pivots, motors and actuators if present. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Check proper operation and reporting of monitoring hardware. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect sealed electrical components for condensation buildup. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.
- Inspect wiring and hardware for signs of damage from vandalism or animal damage. Operator to resolve issues as needed under the terms of this O&M contract, the EPC Contract or Manufacturer's Warranty. If any costs are to be incurred by the Project

Owner, Operator will notify the Project Owner, present proposal and wait for authorization on a course of action from the Project Owner.

- Routine system maintenance to include correction of loose electrical connections, ground connections, replacement of defective modules found during testing, other minor maintenance repair work. Tree trimming, and plant trimming work not included.
- Routine DAS maintenance to include sensor calibration and data integrity check.

TROUBLESHOOTING, INSPECTION AND ADDITIONAL REPAIRS

- Dispatch of field services resources within two business days for repairs up to three times per year or as deemed necessary by Operator.
- Major system repairs, not to include mid-voltage switchgear or transformers.

CUSTOMER SERVICE SUPPORT

- *Support line is available to Project Owner staff to answer questions or report issues.*

MAJOR COMPONENTS

- *Operator will represent Project Owner on all major component issues.*

REPORTING

- Monthly Production report will be available online to the Project Owner personnel.
- Annual Performance report will be sent electronically to the Project Owner personnel.
- O&M Manual updates. Complete versions of new editions to be delivered electronically to the Project Owner staff as they become available.
- As Built drawings update as necessary.

OTHER SYSTEM SERVICES

Facility staff training, one time per site which will include the follow basic training items:

- **General Inspection:** A full visual and physical inspection of all systems components and their immediate surroundings carried out in accordance with inspection checklists.
- **Safety:** Operator will train Project Owner staff on how to safely shut down the system.
- **Tree Trimming/Plant Trimming:** Operator will train Project Owner staff on what vegetation near structures that need to be trimmed as required by local site conditions.
- **Structure Maintenance:** Necessary preventive maintenance may be performed on system structural components to ensure continued safe and effective operation.
- **The basics of performing a visual inspection:** Checklist review with Operator.
- **Performance characterization,** as determined by Operator.
- **O&M Manuals – additional copies,** as needed. Updated editions of O&M manuals will be sent electronically to the Project Owner as they become available.
- **Management of long-term service and warranty agreements,** ongoing. Operator shall provide Project Owner local DFD/AFSD with updates as required.

INVERTER REPAIR

Component replacement and refurbishment as required in the event of inverter failure.

INVERTER INSPECTION AND REGULAR SERVICING AS REQUIRED UNDER INVERTER MANUFACTURER'S WARRANTY

SPECIFICATIONS

Those include but are not limited to the following one time annually:

- Check appearance/cleanliness of the cabinet, ventilation system and all exposed surfaces.
- Inspect, clean/replace air filter elements.
- Check for corrosion on all terminals, cables and enclosure.
- Check all fuses.
- Perform a complete visual inspection of all internally mounted equipment including subassemblies, wiring harness, contractors, power supplies and all major components.
- Check condition of all the AC and DC surge suppressors.
- Torque terminals and all fasteners in electrical power connections.
- Check the operation of all safety devices (E-stop, door switches)
- Record all operating voltages and current readings via the front display panel.
- Record all inspections completed.
- Inform Manufacturer of all deficiencies identified.
- Manufacture will be responsible for the In-Warranty replacement of failed inverter components, parts and labor.

SERVICES UNDER THE FOLLOWING WARRANTIES

- 20-year warranty for inverters as set forth in Exhibit F of the EPC Contract.
- 25-year warranty for PV Modules as set forth in Exhibit F of the EPC Contract.

1.3 EXHIBIT B – ADDITIONAL SYSTEM SERVICES

1.3.1 ADDITIONAL SERVICES FOR YEARS 1 – 10

- Additional system and component training.
- Operations, and Maintenance training in additional to what is already included in Exhibit A above.
- System performance evaluation will be covered under out 10-year Performance Guarantee for the first 10 years but is not included in this O&M agreement
- Vegetation management.
- Module Cleaning. Operator may at its option and at no cost to the Project Owner clean the modules to ensure peak performance of the Solar System. Such cleaning is subject to Project Owner approval. If the Project Owner requests module cleaning, Operator shall provide the Project Owner with a competitive quote based on current market prices.
- Security services.
- Response and Repairs due to accidental damages upon request.

- Additional Maintenance, Inspection and Repair available upon request.
- Data Line: Project Owner shall provide Operator a high-speed internet data line for each site during the Term to enable the Operator to record the electric energy generated by the System.

1.3.2 ADDITIONAL SERVICES FOR YEARS 11 – 20

- Additional system and component training
- Operations, and Maintenance training in additional to what is already included in Exhibit A above.
- System performance evaluation will be provided to the Project Owner one time annual in our annual performance report.
- Vegetation management.
- Module Cleaning. Operator may at its option and at no cost to the Project Owner clean the modules to ensure peak performance of the Solar System. Such cleaning is subject to Project Owner approval. If the Project Owner requests module cleaning, Operator shall provide the Project Owner with a competitive quote based on current market prices.
- Security services.
- Response and Repairs due to accidental damages upon request.
- Additional Maintenance, Inspection and Repair available upon request.
- Data Line: Project Owner shall provide Operator a high-speed internet data line for each site during the Term to enable the Operator to record the electric energy generated by the System.

**ATTACHMENT 6:
PROJECT CONTACTS**

Project Proponent:

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Worcester, Massachusetts 01605

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Vice President
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AChristie@ProtechEnergySolutions.com

Engineering Firm:

Meridian Associates, Inc.
500 Cummings Center
Beverly, MA 01915

Christopher A. Ryan
Project Manager
(978) 299-0447 x227
CRyan@MeridianAssoc.com

Property Owners:

Penelope Johnson
5 Hatfield Street
Haydenville, Massachusetts 01039

**ATTACHMENT 7:
MAJOR EQUIPMENT**

ARCCOM

FEATURES

- String level arc fault detection
- Remote shutdown
- Contactor disconnect
- Audible indication
- LED indicators
- Dry contact indication
- 16 or 24 fused positions
- Multiple fuse sizes
- Switch locking mechanism
- Lowest power consumption in the industry

OPTIONS

- Connection plates for field-crimped lugs
- Surge arrestor
- Internal power supply



ADVANCED STRING COMBINERS

Solectria Renewables' advanced string combiner (ARCCOM) offers the best quality, durability, ease-of-installation, mounting flexibility, safety and protection features. The ARCCOM is compliant with the latest NEC arc fault and rapid shut down requirements and offers contactor disconnect, lockable switch, string level arc fault protection, allowing the ARCCOM to detect and interrupt a series arc. It is designed and built for rugged conditions, wide temperature ranges and is HALT tested to extremes so all components are carefully vetted for highest reliability. ARCCOM also features standard oversized compression lugs that allow for long home run conductors. You may choose a 24VDC external power supply, a fire-panel auxiliary 24V output supply or optional integrated 120VAC power supply. Additional options include surge arrestor and stud connector plates for those installers that prefer crimped connectors.



ARCCOM SPECIFICATIONS		
PRODUCT	ARCCOM	
Number of Fused Inputs	16	24
Input Wire Range	14-6 AWG	
Output Wire Range	(2) 1 AWG - (2) 600 kcmil*	(2) 3/0 kcmil - (2) 600 kcmil*
Maximum Voltage	600 or 1000 VDC	
Maximum Continuous Current	192 A	288 A
Available String Fuses	4A, 6 A, 8A, 10A, 12A, 15A	
Operating Temperature	-40°F to +122°F (-40° C to +50°C)	
Mounting Locations	Indoor, Outdoor, Wall, Array, Rooftop - Vertical or Horizontal	
Certifications		
Safety Listings & Certifications	UL 1741, CSA C22.2#107.1, UL 1699B	
Certification Agency	ETL	
Warranty		
Standard	5 year	
Power Supply/Signals		
Standard Power Supply Input	24 VDC / 0.32 A (max)	
Optional Integrated Power Supply	100-277 VAC	
Dry Contact Arc Fault Detection	24V / 5 A rated	
Enclosure		
Dimensions (H x W x D)	20 in. x 24 in. x 7 in. (508 x 610 x 178 mm)	
Weight	41 lbs (18.5 kg)	
Enclosure Rating	Type 4	
Enclosure	Polyester powder coated steel	

*Inquire about option (code) for field-crimp lug plates for output terminals

EnvirotempTM FR3TM fluid Formulated for performance.



Envirotemp™ FR3™ fluid.
Trusted worldwide
a million times over.





With over one million installations across six continents and validated in over 250 tests, Cargill's Envirotemp™ FR3™ natural ester fluid is trusted by our customers to deliver cost-effective solutions that help improve transformer performance reliably and safely.

Our team of dielectric experts is active in the standards community globally and has extensive knowledge of not only dielectric fluid properties but also fluid performance in

application. And they have transformer design experience, too. This means our customers adopting FR3 natural ester technology have comprehensive dielectric fluids support from initial planning stages through best practices implementation and beyond.

Backed by Cargill's global supply chain network, our customers can rely on us to deliver the best solution for their application - when they need it, anywhere in the world.

With FR3 fluid, our customers can:

- Gain cost efficiencies either on initial cost or total cost of ownership without sacrificing reliability.
- Extend transformer insulation and asset life.
- Optimize load capacity.
- Significantly improve fire safety.
- Enhance their environmental footprint and sustainable supply chain initiatives.

Improve performance with life extension and loading flexibility.

Protect insulation life to extend asset life.

Insulation paper is one of the primary factors that determines the life of a transformer. FR3™ fluid's unique chemistry absorbs free water and essentially wicks it away from the insulation paper. FR3 fluid has 10 times the water saturation level of mineral oil. This results in extending the insulation life 5-8 times longer than mineral oil.



Insulation aging study comparing thermally upgraded paper using FR3 fluid vs. mineral oil.

- Save significantly on replacement costs by extending the asset life with FR3 fluid.
- Reduce the risk of failure to improve reliability of the transformer.
- Reduce processing maintenance costs, since FR3 fluid does not sludge like mineral oil.

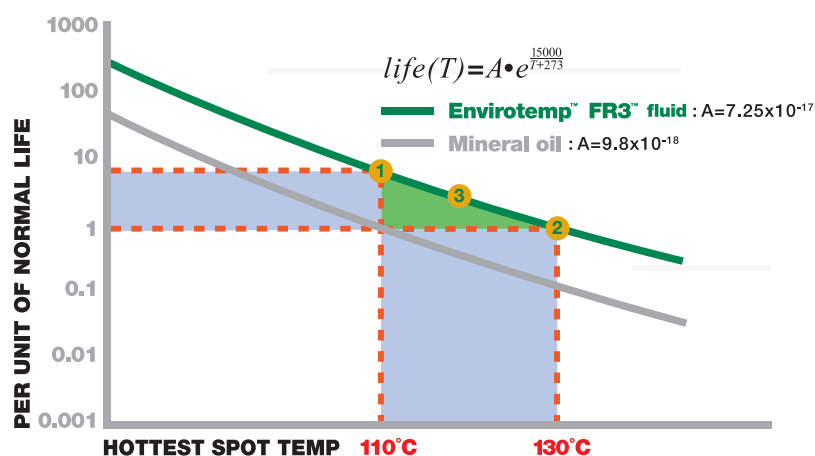
With FR3™ fluid’s unique capabilities to extend insulation life and increase load capacity, organizations now have the flexibility to optimize their transformer fleet loading profiles in order to gain cost savings without sacrificing reliability.

Leverage higher thermal capability with FR3 fluid.

Historically, standards were written to accommodate a 95°C or 110°C hot spot for cellulose and Thermally Upgraded Kraft (TUK), respectively. However, published high temperature insulation system standards - IEC (60076-14) and IEEE (C157.154) – accommodate a 15°C or 20°C increase in hot spot without sacrificing the life or reliability of the transformer, when immersed in natural ester fluid.

Paper	Dielectric Fluid	Thermal Class	Hot spot	IEEE AWR	IEC AWR
TUK	Mineral Oil	120	110°C	65°C	75K
TUK	Natural Ester	140	130°C	85°C	95K

TUK life curves



- OPTION 1:** Extend asset life at current 110° hotspot.
- OPTION 2:** Increase load capability up to 20% with 130°C hotspot.
- OPTION 3:** Incrementally extend asset life and increase load capability with 120°C hotspot.

IEC 60076-14 Part 14: Liquid-immersed power transformers using high-temperature insulation materials. Edition 1.0 September 2013.
 IEEE C57.154 Standard for the Design, Testing, and Application of Liquid-Immersed Distribution, Power, and Regulating Transformers Using High-Temperature Insulation Systems and Operating at Elevated Temperature. Published October 30, 2012.

Improve fire safety.

Add more sustainability to your sustainable supply chain.



Reduce costs while increasing fire safety.

FR3™ fluid has the highest fire point of any dielectric fluid (360°C compared to 160°C for mineral oil) making it the ideal choice for densely populated areas where transformers are positioned indoors, underground or in close proximity to buildings and other equipment. FR3 fluid is a K-class, less flammable fluid as certified by Underwriters Laboratory and approved by FM Global.

- Reduce clearance to buildings which saves precious real estate, particularly in space-constrained areas.
- Retrofill older transformers with FR3 fluid instead of replacing or moving them to help comply with current fire code regulations.
- For power transformers, potentially eliminate the need for expensive fire walls and deluge systems (and their ongoing maintenance costs).



“Being green” also benefits your bottom line.

FR3 fluid not only has best-in-class environmental properties, but with its enhanced thermal capabilities enabling smaller transformer designs, your supply chain just got a whole lot more sustainable.

- Smaller, more efficient transformer designs:
 1. Use less fluid and construction materials.
 2. Are typically lighter which could make installations easier for work crews and could reduce transportation costs.

Envirotemp™ FR3™ fluid properties: standard acceptance values and typical values

PROPERTY	Standard test methods		ASTM D6871	IEC 62770	Envirotemp FR3 fluid
	ASTM	ISO/IEC	As-received new fluid property requirements	Unused new fluid property requirements	TYPICAL
Physical					
Color	D1500	ISO 2211	≤1.0		0.5
Flash Point PMCC (°C)	D93	ISO 2719		≥250	255
Flash Point COC (°C)	D92	ISO 2592	≥275		320-330
Fire Point (°C)	D92	ISO 2592	≥300	>300	350-360
Pour Point (°C)	D97	ISO 3016	<-10	≤-10	-18 - -23
Density at 20°C (g/cm³)		ISO 3675		≤1.0	0.92
Relative Density (Specific Gravity) 15°C	D1298		≤0.96		0.92
Viscosity (mm²/sec)	D445	ISO 3104			
			≤15	≤15	7.7 - 8.3
			≤50	≤50	32 - 34
			≤500		190
Visual Examination	D1524	IEC 61099 9.2	bright and clear	clear, free from sediment and suspended matter	clear, light green
Biodegradation		OECD 301	readily biodegradable	readily biodegradable	ultimately biodegradable
Electrical					
Dielectric Breakdown (kV)	D877		≥30		47
Dielectric Breakdown (kV)					
	1mm gap	D1816	≥20		28
	2mm gap	D1816	≥35		48-75
	2.5mm gap			≥35	73
Gassing Tendency (mm/min)	D2300	IEC 60156	≤0		-79
Dissipation Factor					
	25°C (%)	D924	≤0.20		0.010 - 0.15
	90°C (tan δ)			≤0.05	0.02
	100°C (%)	D924	≤4.0		0.41 - 3.85
Chemical					
Corrosive Sulfur	D1275	IEC 62697	non-corrosive	non-corrosive	non-corrosive
Water Content (mg/kg)	D1533	IEC 60814	≤200	≤200	4 - 50
Acid Number (mg KOH/g)	D974	IEC 62021.3	≤0.06	≤0.06	0.013 - 0.042
PCB Content (mg/kg)	D4059	IEC 61619	not detectable	free from PCBs	not detectable
Oxidation Stability (48 hrs, 120°C)		IEC 61125C			
	Total Acidity (mg KOH/g)			≤0.6	0.1
	Viscosity at 40°C (mm²/sec)	ISO 3104		≤30% increase over initial	17.1% increase
	Dissipation Factor at 90°C (tan δ)	IEC 60247		≤0.5	0.1

NOTE: Specifications should be written referencing only the defined ASTM or IEC industry standard acceptance values and test methods. The listed 'typical' values are average values summarized from a significant number of data points over many years; they are not to be identified as acceptance values.

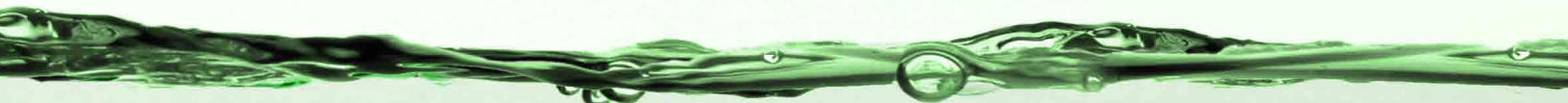
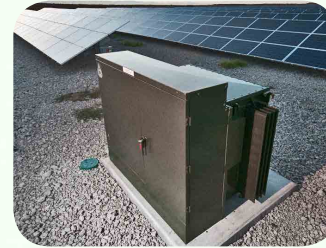
ASTM D6871 Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus.

IEC 62770: Fluids for electrotechnical applications – Unused natural esters liquids for transformers and similar electrical equipment.

A transformer filled with FR3™ fluid complies with the transformer temperature operating range requirements defined in IEEE C57.12.00 and IEC 60076-1.

The information presented herein is believed to be true and accurate. However, all statements, recommendations and suggestions are made without guarantee, express or implied, and are subject to change without notice. WE DISCLAIM ALL WARRANTIES, EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION THE IMPLIED WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE and FREEDOM FROM INFRINGEMENT and disclaim all liability in connection with the use of the products or information contained herein. All such risks are assumed by the equipment manufacturer/user and the final determination of suitability of each use application is the responsibility of the equipment manufacturer/user. Products may present unknown hazards and should be used with caution. Although certain hazards are described herein, we do not guarantee that these are the only hazards that exist.

- Made from a renewable source with global, reliable supply.
- Carbon neutral (according to BEES 4.0 lifecycle analysis).
- Non-toxic and non-hazardous in soil and water.
- Biodegrades in less than 28 days.
- Contains no petroleum, halogens, silicones or sulfurs.
- Recyclable.



contact us - envirotempfluids.com

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-CIS-SalesTR@Cargill.com



SGI 500XTM SGI 750XTM

FEATURES

- Compliant with NEC 2014 690.11 & 690.12 arc fault and rapid shutdown requirements when coupled with ARCCOM combiner
- 98% CEC efficiency
- 1000 VDC
- Parallel power stages
- Fuse and breaker subcombiner options
- Modbus communications
- User-interactive LCD

OPTIONS

- Stainless steel enclosure
- Web-based monitoring
- Built-in cellular connectivity
- AC breaker with shunt trip
- Revenue grade metering
- Air filters
- Uptime guarantee

OPTIONS FOR UTILITIES

- Real power curtailment
- Reactive power control
- Voltage ride through
- Frequency ride through
- Controlled ramp rates
- DMS tie-in
- Plant master controller
- Rule 21 compatible



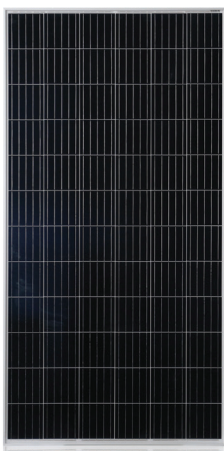
1000VDC UTILITY-SCALE INVERTERS

The only 1000VDC inverter available that is compliant with NEC 2014 690.11 & 690.12 arc fault and rapid shutdown requirements. Solectria's next generation of SMARTGRID series inverters are optimized for high efficiency, reliability, and economy. Available in two power classes, 500 kW and 750 kW, these inverters are designed for direct connection to an external transformer for large commercial or utility-scale applications. They are robust, outdoor rated inverters that can be configured as 1 or 1.5 MW Solar Stations. Available utility-scale options include a plant master controller and advanced grid management features such as voltage and frequency ride through, reactive power control, real power curtailment and power factor control. Listed to 1000 VDC, with 98% CEC weighted efficiency, the SGI 500/750XTM inverters set a new standard for large scale power conversion.



SPECIFICATIONS	SGI 500XTM	SGI 750XTM
DC Input		
Absolute Maximum Input Voltage	1000 VDC	
Max Power Input Voltage Range (MPPT)*	545-820 VDC	
Operating Voltage Range	545-1000 VDC	
Maximum Operating Input Current	965 A	1445 A
Strike Voltage	700 V	
AC Output		
Native Output Voltage	380 VAC, 3-Ph	
AC Voltage Range	-12/+10%	
Continuous Output Power	500 kW	750 kW
Continuous Output Current	760 A	1140 A
Maximum Backfeed Current	0 A	
Nominal Output Frequency	60 Hz	
Output Frequency Range	57-60.5 Hz	
Power Factor	Adjustable - 0.8 to +0.8, factory set at 1	
Total Harmonic Distortion (THD) @ Rated Load	< 3%	
Efficiency		
Peak Efficiency	98.3%	
CEC Efficiency	98.0%	
Tare Loss	89 W	123 W
Subcombiner Options		
Fuses	4 to 16 positions, 100-400 A	
Breakers	4 to 15 positions, 125-350 A	
Temperature		
Ambient Temperature Range (full power)	-40°F to +122°F (-40°C to +50°C)	
Storage Temperature Range	-40°F to +122°F (-40°C to +50°C)	
Relative Humidity (non-condensing)	5-95%	
Data Monitoring		
Optional SolrenView Web-based Monitoring	Integrated	
Optional Revenue Grade Monitoring	800 A	1600 A
Optional SolZone™ Sub-Array Monitoring (DC Current)	1 zone per protected input (up to 16 zones)	
Optional Cellular Communication	SolrenView AIR	
External Communication Interface	RS-485 SunSpec Modbus RTU	
Testing & Certifications		
Safety Listings & Certifications	UL 1741/IEEE 1547, CSA C22.2#107.1	
Testing Agency	ETL	
Warranty		
Standard	5 year	
Optional	10, 15, 20 year; extended service agreement; uptime guarantee	
Dedicated External Transformer		
Dedicated External Transformer	Required, provided by customer to Solectria's specification	
Transformer Type	Self cooled, step up, pad mount	
Output Voltage	Typical: 2.4-36.0 kV, 3-Ph	
Enclosure		
dB(A) (Decibel) Rating	< 67 dB(A) @ 10 m	
DC Disconnect (integrated)	Standard	
AC Disconnect/Breaker (integrated)	Optional disconnect, breaker or breaker with shunt trip	
Dimensions (H x W x D)	82 in. x 109 in. x 41 in. (2083 mm x 2769 mm x 1042 mm)	
Shading Set Back	137" (3480 mm) at 30° solar elevation	
Shipping Weight	3080 lbs (1398 kg)	3570 lbs (1620 kg)
Enclosure Rating	Type 3R	
Enclosure Finish	Polyester powder coated steel; optional 316 stainless steel	

*At nominal AC voltage



STAVE™

Crystalline PV Module

CHSM6612P Series

CHSM6612P/HV Series

- ▶ With innovational 5-busbar cells
- ▶ Reducing cell series resistance
- ▶ Increasing cell efficiency
- ▶ More power output

CHSM6612P max system voltage 1000V standard, CHSM6612P/HV max system voltage 1500V standard

310 315 320 325 330

EN

ELECTRICAL SPECIFICATIONS

	310	315	320	325	330
STC rated output (P _{mpp})*	310 Wp	315 Wp	320 Wp	325 Wp	330 Wp
PTC rated output (P _{mpp})**	282.5 Wp	287.2 Wp	291.9 Wp	296.6 Wp	301.3 Wp
Standard sorted output	0/+5 Wp				
Warranted power output STC (P _{nominal})	310 Wp	315 Wp	320 Wp	325 Wp	330 Wp
Rated voltage (V _{mpp}) at STC	36.91 V	36.99 V	37.02 V	37.11 V	37.15 V
Rated current (I _{mpp}) at STC	8.40 A	8.53 A	8.65 A	8.77 A	8.89 A
Open circuit voltage (V _{oc}) at STC	45.15 V	45.30 V	45.45 V	45.67 V	45.86 V
Short circuit current (I _{sc}) at STC	8.92 A	9.04 A	9.25 A	9.48 A	9.52 A
Module efficiency	16.0%	16.3%	16.5%	16.8%	17.1%
Rated output (P _{mpp}) at NOCT	216.5 Wp	220.0 Wp	223.5 Wp	226.9 Wp	230.4 Wp
Rated voltage (V _{mpp}) at NOCT	33.71 V	33.74 V	33.80 V	33.86 V	33.92 V
Rated current (I _{mpp}) at NOCT	6.42 A	6.52 A	6.61 A	6.70 A	6.79 A
Open circuit voltage (V _{oc}) at NOCT	41.43 V	41.57 V	41.70 V	41.91 V	42.08 V
Short circuit current (I _{sc}) at NOCT	6.90 A	6.99 A	7.15 A	7.33 A	7.37 A
Temperature coefficient (P _{mpp})	- 0.408%/K				
Temperature coefficient (I _{sc})	+0.050%/K				
Temperature coefficient (I _{mpp})	- 0.003%/K				
Temperature coefficient (V _{mpp})	- 0.406%/K				
Temperature coefficient (V _{oc})	- 0.311%/K				
Normal operating cell temperature (NOCT)	46±2°C				
Maximum system voltage (IEC/UL)	1000V _{DC} / 1000V _{DC} or 1500V _{DC} / 1500V _{DC}				
Number of diodes	3				
Maximum series fuse rating	15 A				

* Measurement tolerance +/- 3%

** Estimated



RELATED PARAMETERS

Cell type	Polycrystalline
Number of cells / cell arrangement	72 / 6 x 12
Cells dimension	6"
Packing unit	27 modules
Weight of packing unit (for container)	646 kg / 1424 lbs

MECHANICAL SPECIFICATIONS

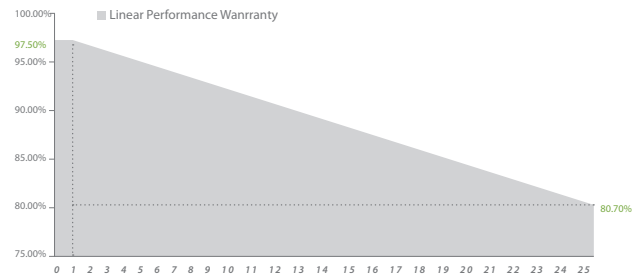
Outer dimensions (L x W x H)	1954 x 990 x 40 mm 76.93 x 38.98 x 1.57 in
Frame technology	Aluminum, silver anodized
Module composition	Glass / EVA / Backsheet (white)
Weight (module only)	21.8 kg / 48.1 lbs
Front glass thickness	3.2 mm / 0.13 in
Junction box IP rating	IP 67
① Cable length (UL/IEC)	1150 mm / 45.28 in
Cable diameter (UL/IEC)	12 AWG / 4 mm ²
② Maximum load capacity	5400 Pa
Fire performance (UL/IEC)	Type 1 (UL) or Class C (IEC)
Connector type (UL/IEC)	MC4 compatible

① Option: 900(+)/600(-) mm for defined projects in advance.

② Refer to Astronergy crystalline installation manual.

QUALIFICATION AND LINEAR WARRANTIES

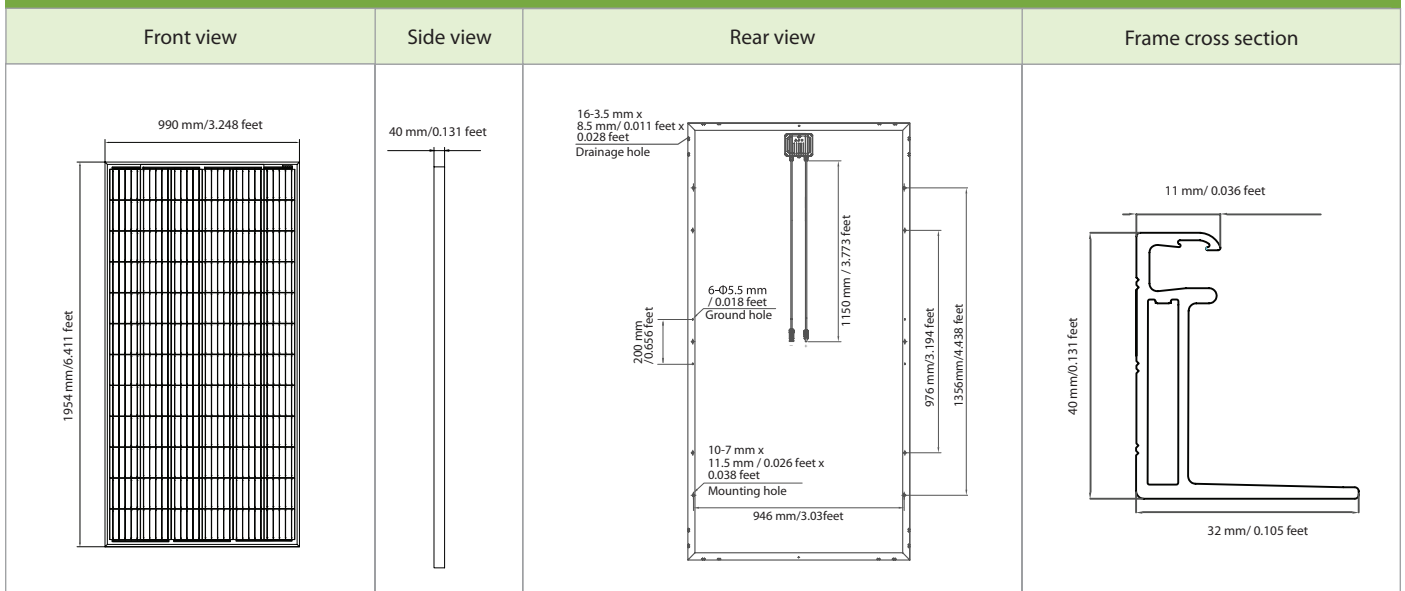
Product standard	IEC 61215, 61730 / UL1703
Extended product warranty	10 years
Output decline 2.5%/year performance P _{mp} (STC)	1 st year
Output decline 0.7%/year performance P _{mp} (STC)	2 nd - 25 th years



ARTICLE NUMBER

Model	Article No. (IEC)	Article No. (UL)
(STAVE) CHSM6612P-310	200794	200777
(STAVE) CHSM6612P-315	200769	200778
(STAVE) CHSM6612P-320	200770	200779
(STAVE) CHSM6612P-325	200771	200780
(STAVE) CHSM6612P-330	200772	200781
(STAVE) CHSM6612P/HV-310	500169	500152
(STAVE) CHSM6612P/HV-315	500144	500153
(STAVE) CHSM6612P/HV-320	500145	500154
(STAVE) CHSM6612P/HV-325	500146	500155
(STAVE) CHSM6612P/HV-330	500147	500156

MODULE DIMENSION DETAILS



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TerraFarm Data Sheet



TerraFarm Ground Mount - Landscape

Application:	Commercial to Utility Scale
Grounding:	ETL listed, Electrically bonded system, verified Wiley
Panel Orientation:	Landscape
Array Configurations:	Up to 7 panels high and up to 12 panels long
Tilt Angle:	5 – 45 degrees
Lower Panel Clearance:	Up to 48 inches, standard
Loading Conditions:	Up to 160 mph wind speed, 80 psf snow load, Exposure C
Warranty:	20-year limited warranty
Engineering:	Professional Engineer Stamped Drawings Available in 50 States Custom Engineered to Exceed Applicable ASCE, IBC, and UL Standards.
Material:	Galvanized steel (G90 or Better)
East-West Slope:	20% maximum
North-South Slope:	60% maximum, limited by installation equipment
Max Fuse Rating:	30 Amp Fuse Rating

Max Capacity of PV modules:

12 High x 12 Wide (144 Panels):	Listed Frameless (Thin Film) PV Module (21"-26" x 47"-51")
7 High x 10 Wide (70 Panels):	54 Cell Listed Aluminum Framed PV Module (37"-41" x 56"-60")
7 High x 9 Wide (63 Panels):	60 Cell Listed Aluminum Framed Module (37"-41" x 63"-67")
7 High x 8 Wide (56 Panels):	72 Cell Listed Aluminum Framed Module (37"-41" x 75"x79")



Benefits

Minimal hardware to assemble

No in-field drilling, cutting, or welding

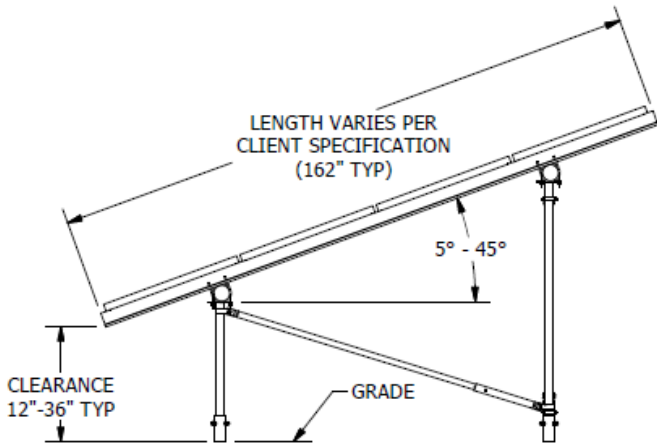
Significantly reduces installed labor costs

Integrated foundation solution

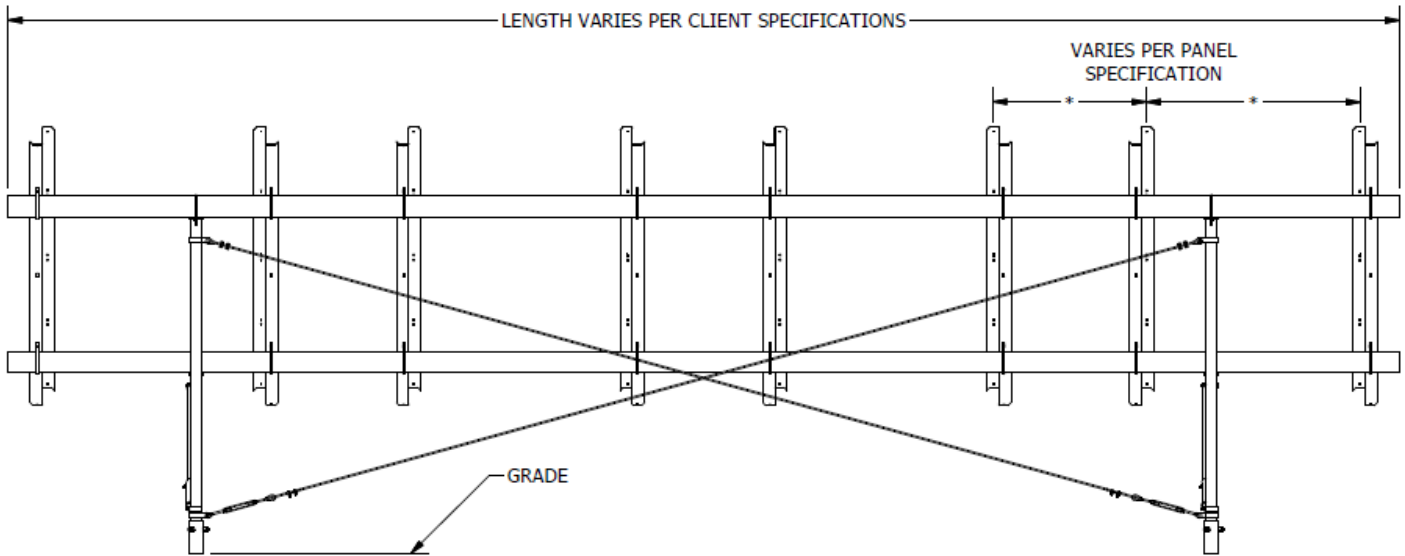
Turn-key installation service available, Foundation to Panels

Pre-assembly options available

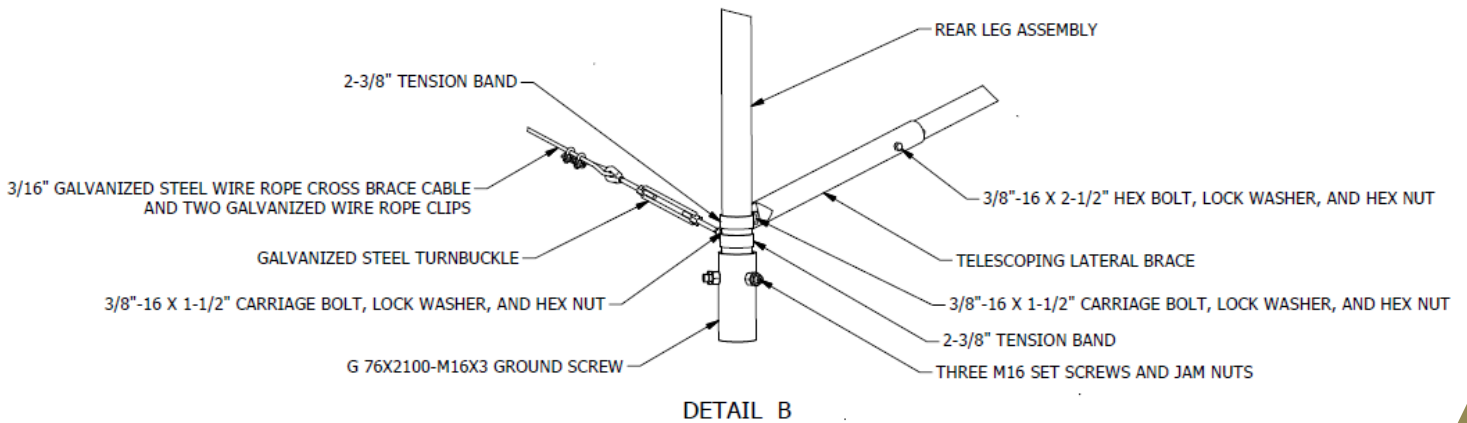
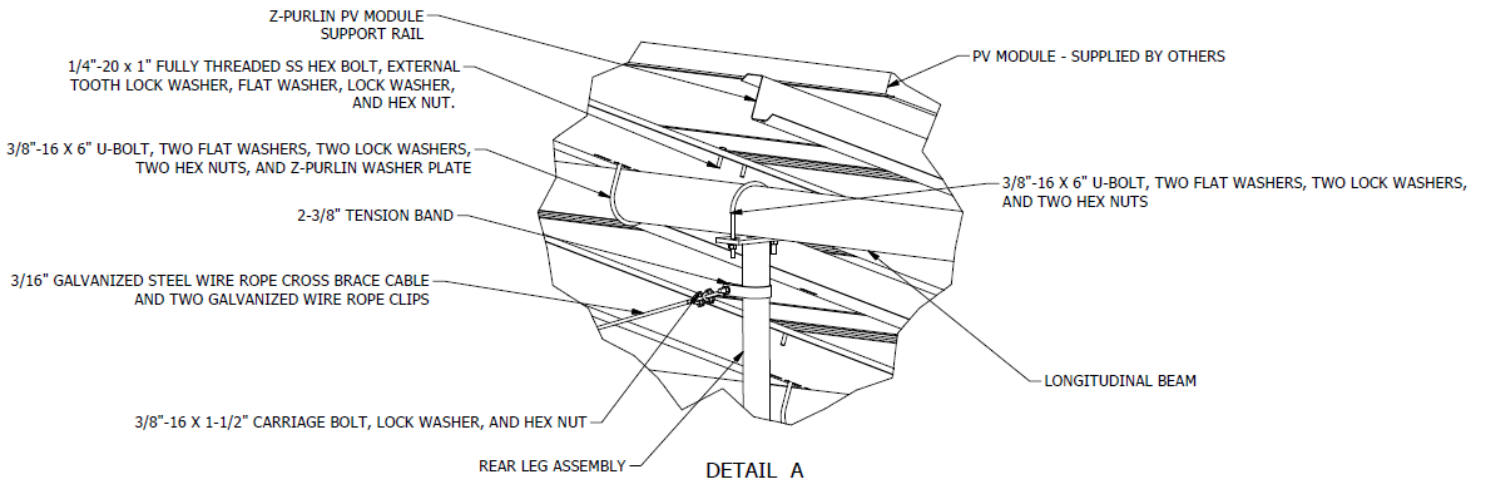
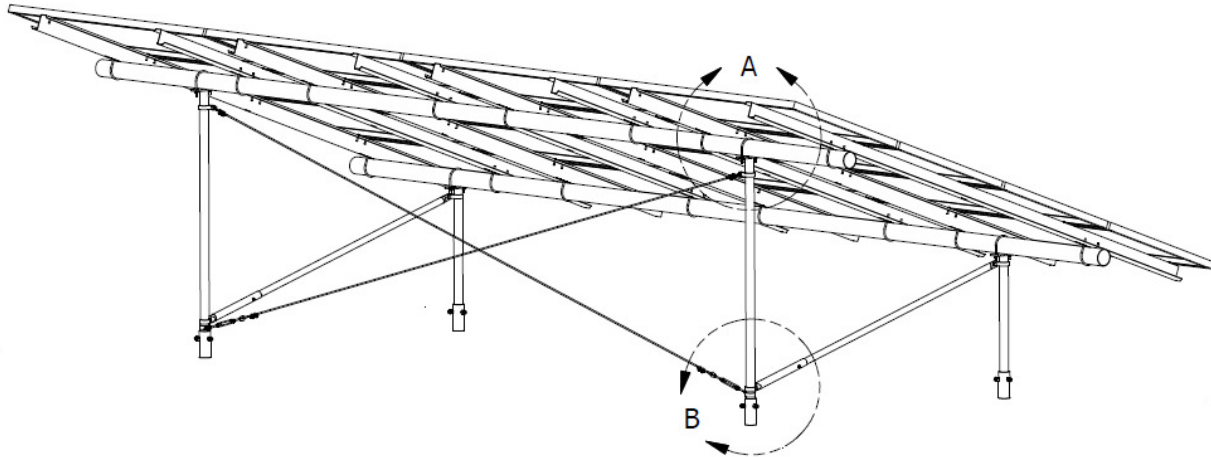
Maximum adjustability for following grade



SIDE ELEVATION
(TYPICAL INSTALLATION)



REAR VIEW
(TYPICAL INSTALLATION)



Underground Distribution Switchgear

VFI Underground Distribution Switchgear

GENERAL

Cooper Power Systems VFI underground distribution switchgear provides superior overcurrent protection through the use of proven, reliable vacuum fault interrupters from Cooper Power Systems. The resettable vacuum fault interrupter allows immediate service restoration, eliminating the added expense and downtime associated with stocking and replacing fuses.

Deadfront construction provides a higher level of safety for operating personnel. With the addition of visible-break switches, circuits can be isolated and grounded without disconnecting or moving terminations.

A sealed insulation system offers the further advantage of low-maintenance, and permits construction of a compact, low-profile unit that is less obtrusive than a comparable air-insulated design. Insulation options include the environmentally-preferred high-fire-point E200™ fluid and Envirotemp™ FR3™ fluid, as well as mineral oil and Sulfur Hexafluoride (SF₆) gas.

VFI switchgear is used for commercial/industrial and utility applications, and can be easily coordinated in the field without a PC, using field-selectable settings to



Figure 1. VFI underground distribution switchgear offers a simplified approach to the protection of 15, 25, and 35 kV underground systems, and provides a wide choice of switching combinations to meet system requirements.

meet distribution system protection requirements. Ratings of VFI switchgear are shown in Table 1.

TABLE 1
Ratings for VFI Switchgear and Load-Break Switch*

Nominal Voltage		15 kV	15 kV	25 kV	35 kV
Maximum Design Voltage, kV		15.5	15.5	27.0	38.0
BIL, kV		95	95	125	150
1-minute Withstand Voltage (60 Hz), kV		35	35	60	70
Momentary Current, 10 cycles (sym.), kA		12.5	16.0	12.5	12.5
3-second Withstand Current (sym.), kA		12.5	16.0	12.5	12.5
Vacuum Fault Interrupter	Continuous Current, (max.), A	600**	600**	600**	600
	Interrupting Current (sym./asym.), kA	12.5/20.0	16/25.8	12.5/20.0	12.5/20.0
	Making Current (sym.), kA	12.5	16.0	12.5	12.5
	Cable Charging Interrupting Current, A	10.0	10.0	25.0	40.0
Load-Break Switch	Continuous Current, (max), A	600	600	600	600
	Load Switching, A	600	600	600	600
	3-Shot Make and Latch (asym.), kA	20.0	25.8	20.0	20.0

* Continuous and short-circuit currents may be limited by ratings of selected bushings.

** 900 A and 1200 A continuous-current ratings are also available.

FEATURES AND DETAILED DESCRIPTION

VFI Switchgear

Cooper Power Systems VFI underground distribution switchgear provides a simple, economical approach to protective requirements for 5, 15, 25, and 35 kV underground systems.

The deadfront construction of VFI switchgear improves safety for utility personnel and the general public. Inside, all terminations are covered with insulating rubber that is grounded. All internal parts are completely sealed in a steel tank to reduce maintenance and eliminate the problems of moisture, dirt, and wildlife.

This fluid-insulated, sealed design offers an added advantage: an unobtrusive, low-profile appearance.

VFI switchgear is versatile in its application. It is suited for commercial/industrial and utility requirements.



Figure 2.
Compact single-sided units are available in vault and pad-mounted styles.

Single-sided compact style VFI switchgear units are ideal for areas where access is limited; such as next to a transformer, behind a building, against a wall, or in a vault. The VFI vault-style unit is suitable for indoor applications including commercial and industrial electrical equipment rooms. 5- and 6-way units are ideal for large retail complexes and campuses (military, university, industrial park) with multiple loads.

For sustained reliability, Cooper Power Systems VFI switchgear has 30 years of excellent field performance. The VFI switchgear's interrupting duty cycle is unmatched in the industry, providing a full 232 interruptions per IEEE Std C37.60™-2003 standard (see Table 2).



Figure 3.
VFI switchgear 6-way unit.

Tri-Phase Control

The Tri-Phase electronic control provides a flexible solution for time-current-curve coordination. The Tri-Phase control offers over 100 minimum trip settings and an assortment of time-current curves. With standard instantaneous trip and optional ground trip and minimum response characteristics, the Tri-Phase control will satisfy system protection and coordination needs. A wide selection of TCCs and minimum trip settings make it easily adaptable to distribution systems.

Edison™ Idea™ Relays

Edison™ Idea™ relays allow enhanced functionality in protection and communication.

The IDEA Workbench™ embedded within the ProView™ software allow unsurpassed flexibility in customizing the relay protection and control functions through downloadable Custom Software Modules.

Depending on the relay selected, Edison Idea relays can provide protective functions such as overcurrent with or without ground detection, over/under voltages, reverse power, and negative sequence to name a few.

IMPORTANT: For applications requiring SF₆ insulated switchgear, contact your Cooper Power Systems representative when selecting a relay/controller that has metering and protective elements requiring potential transformers.

Advanced metering and analytics are also available which are critical to providing Distribution Automation capability.

Single- or Three-Phase Tripping

Most commercial loads consist of large three-phase transformers. Many transformers are protected with single-phase fuses. Typically, only one of the fuses will open during an overcurrent condition. This “single-phases” three-phase commercial loads, and may cause damage to three-phase motors and other equipment. VFI switchgear solves this problem by providing three-phase ganged tripping. An overcurrent on any phase automatically opens all three phases simultaneously.

VFI switchgear can also be specified with single-phase trip, to provide individual phase protection for single-phase residential applications.

VFI switchgear can also serve as a vacuum load-break switch. Tap switching has traditionally been accomplished by pulling load-break elbows. With VFI switchgear, the tap can be switched with a simple push-pull of the operating handle.

TABLE 2
Interrupting Duty Cycle

Minimum Full Life Fault Interrupting Duty Cycle per IEEE Std C37.60™-2003 standard (2 duty cycles)		Number of Operations
Percent of Interrupting Current Rating:	15-20%	88
	45-55%	112
	90-100%	32
Total		232



Figure 4.
VFI switchgear source-side switch components (some optional components shown).

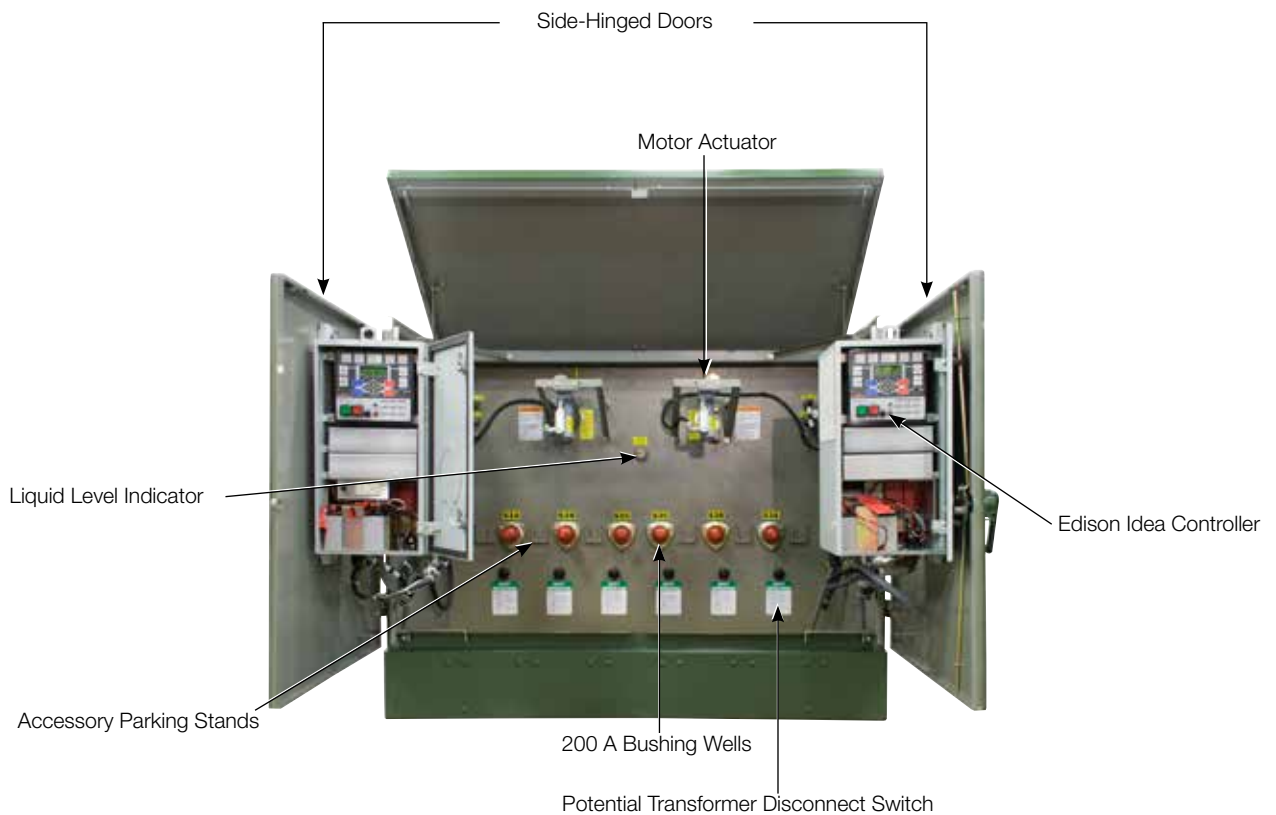


Figure 5.
VFI switchgear tap-side components (some optional components shown).

Vacuum Load-Break Switch

Source switching is accomplished by three-phase, vacuum load-break switches. The ratings for the vacuum switches are in Table 1.

Visible-Break Switch

Visible-break switches are available in two versions—a two-position switch (closed/open) and a three-position switch, (closed/open/ground). Visible-break is accomplished by a separate switch operated from the side of the unit—away from the high voltage compartment. This switch is mechanically interlocked such that the vacuum load-break switch or the vacuum fault interrupter mechanism first interrupts the current and then the visible-break switch may be operated. The visible-break switch is rated 600 A continuous current and has a making current rating up to 16 kA (sym). The ground position allows the cables to be grounded without disconnecting or moving the terminations. The switch contact positions are visible via a large viewing window above the associated bushings. Only VFI switchgear with liquid dielectric may be equipped with a visible-break feature.

Types of Insulation

Cooper Power Systems offers underground distribution switchgear with the widest availability of dielectric media in the industry. Fire-resistant E200 fluid and Envirotemp™ FR3™ fluid, as well as commonly used mineral oil and SF₆ gas, are offered as insulation media for VFI switchgear.

E200 Fluid

E200 fluid is fire-resistant biodegradable, polyol ester-based, non-toxic low viscosity fluid with excellent dielectric, thermal and physical properties. The low viscosity characteristic allows it to be used in VFI switchgear down to -30 °C. Its fire point is greater than 300 °C (572 °F), a requirement for less flammable fluids.

The performance of the switchgear equipment containing E200 fluid is further enhanced by the fluid's other important properties:

- Excellent thermal properties
- High dielectric strength
- Oxidation stability
- Clear bright appearance

Envirotemp™ FR3™ Fluid

Envirotemp™ FR3™ fluid is formulated from edible vegetable oils and food grade performance enhancing additives. It does not contain any petroleum, halogens, silicones, or any other questionable material. It quickly and thoroughly biodegrades in both soil and aquatic environments. The fluid tested non-toxic in aquatic toxicity tests.

Mineral Oil

Mineral oil is a petroleum-based, time-proven insulation and has reliable electrical insulating properties.

SF₆

SF₆ is non-flammable, odorless, colorless gas that requires a gas-tight design and gas monitoring and handling systems.

TABLE 3
Available Dielectric Media -
Minimum Application Limits

E200 Fluid	-30 °C
Envirotemp™ FR3™ Fluid	0 °C
Mineral Oil	-30 °C
SF ₆ Gas	-30 °C

Low Profile Sealed Construction

VFI switchgear features a low-profile cabinet design, with sealed tank construction. This means that VFI switchgear can be used in locations where air-insulated switchgear cannot, such as flood areas or high-contaminant industrial sites. It is resistant to attacks from dust, ice, vegetation, and wildlife.

Stainless Steel

VFI switchgear may be specified in 100% stainless steel construction for the ultimate in corrosion protection. With VFI switchgear from Cooper Power Systems, the entire unit is designed in stainless steel, including the tank and cable compartments. All details and accessories are stainless steel as well. This construction meets the requirements of IEEE Std C57.12.29™-2005 standard, Standard for Pad-Mounted Equipment–Enclosure Integrity for Coastal Environments.

Trip-Free Operation

The vacuum fault interrupter mechanism can be quickly and easily reset manually by pulling the handle to the “reset” position and then moving it to the closed position. However, if a fault is present when the vacuum fault interrupter mechanism is closed, the trip-free feature will prevent the mechanism from being held in the closed position and it will clear the circuit fault.

Low Maintenance

Both load and fault interruption take place within the sealed vacuum fault interrupter with no arcing by-products to contaminate the insulating medium. Advanced technology vacuum fault interrupters are reliable, have long life and require no maintenance. Cooper Power Systems patented design reduces the arc energy—resulting in far less contact erosion and the longest life of any vacuum fault interrupter in the industry. Since there are no expulsion fuses or switching by-products to contaminate the insulation medium, maintenance intervals are greatly increased.

Edison™ Idea™ Relay and Tri-Phase Control

Cooper Power Systems Edison™ Idea™ relay and Tri-Phase control makes use of internally mounted 1000:1 current transformers (CT), one on each phase, to monitor line current. If the current in any phase exceeds the minimum trip level setting, the control begins a user selectable time-current-curve (TCC) delay sequence.

At the completion of the programmed TCC delay, a signal is issued to trip the vacuum fault interrupter mechanism.

CT Circuits

The Tri-Phase control is self-powered by the line current. It requires no external voltage supply or battery backup. Since the Tri-Phase control is powered by the sensing CT circuits, it is not affected by system voltage conditions.

Edison Idea relays require a 120 Vac power source to power their internal battery source. The standard battery



Figure 6. TPG control with SCADA shown.

provided is an 13 Ah. 18 Ah batteries are an option.

Tri-Phase Control Settings

The minimum-trip setting for each phase is selectable. This permits convenient field configuration of the Tri-Phase control, to meet specific application requirements.

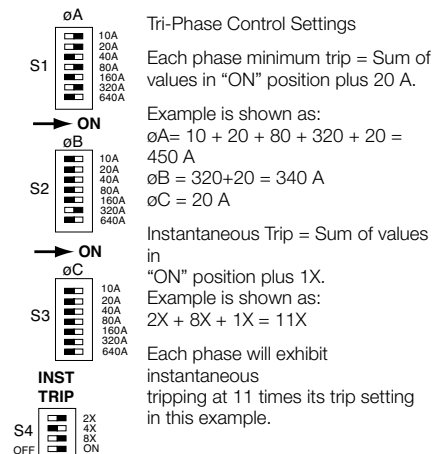


Figure 7. Tri-Phase control settings.

The control features an assortment of field replaceable TCC modules, each provides a fixed time-current-curve characteristic. The variety of modules available provides coordination flexibility between the Tri-Phase control and other protective equipment.



Figure 8. Typical Tri-Phase Control TCC module.

Tri-Phase Control Normal Load

At normal system current, the Tri-Phase control is effectively dormant. Load current is continuously being compared to the selected minimum-trip settings, but the TCC and trip circuits are not activated.

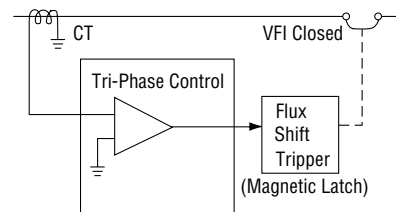


Figure 9. Normal load diagram.

Tri-Phase Control Overcurrent Protection

The TCC circuit is activated when current above the pre-selected minimum trip value is sensed. Once activated, the TCC circuit uses the magnitude of the overcurrent to establish a time delay. At the completion of the delay, the trip circuit pulses the Flux Shift Tripper, which causes it to trip open the vacuum fault interrupter mechanism.

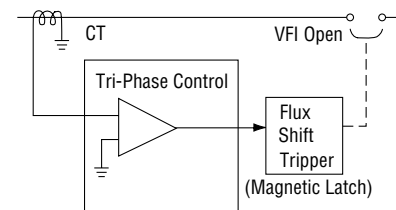


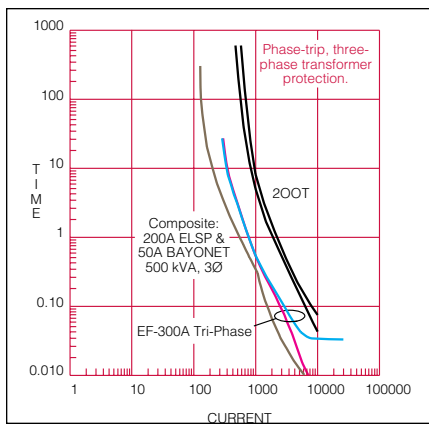
Figure 10. Tri-Phase control overcurrent protection diagram.



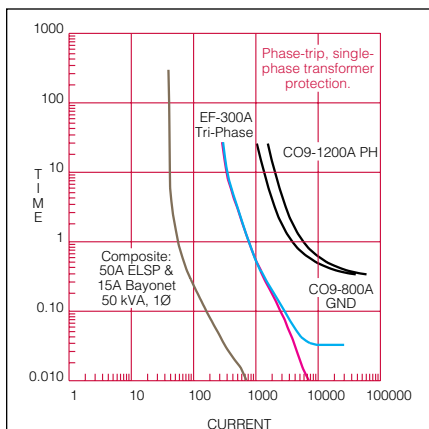
Figure 11. Edison Idea iTAP-260 relays.

Tri-Phase Control Coordination Flexibility

The E time-current curve has long been an industry standard for underground distribution switchgear fusing. However, when several protective devices are present on the same line, it can become difficult to obtain proper system coordination. The Tri-Phase control, with the EF TCC installed, combines classic switchgear protection with state-of-the-art vacuum fault interrupter technology. The Tri-Phase control eliminates the problems normally associated with fuses, but preserves and extends the familiar E-shaped curve to higher currents.



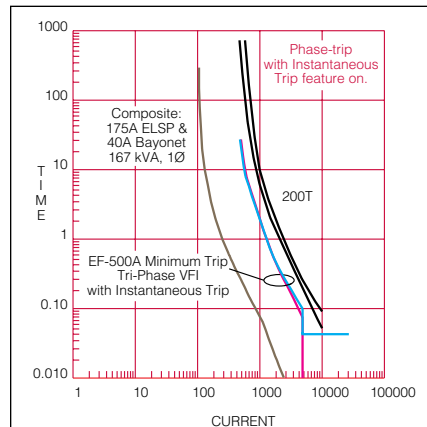
Coordination and application of the Tri-Phase control is identical to fuse application, but with the benefit of a greatly expanded offering of trip ratings and timing curves. In the following example, the EF TCC provides ideal coordination when protecting single-phase distribution transformer loop schemes. The cable can be protected to its rated load with sufficient margin between the EF and the substation breaker.



Tri-Phase Control Instantaneous Trip

Instantaneous trip, a standard feature of the Tri-Phase control, extends the range of coordination with upstream devices, at higher fault levels. A switch on the control circuit board enables the instantaneous trip feature and programs a multiplier that is applied to the standard minimum trip setting. When current above the predetermined fault level is sensed, the instantaneous trip feature causes the control to bypass the normal TCC delay and trip immediately; thus eliminating any intentional time delay. For faults below this actuation level, the control operates according to its normal settings.

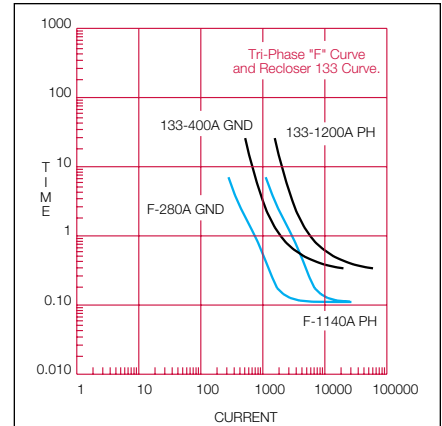
In the example, the EF curve coordinates well with the transformer fusing, although instantaneous trip is required to extend coordination with the upstream T-Link.



Optional Tri-Phase with Ground Trip (TPG)

The optional TPG control operates under the same algorithm as the standard Tri-Phase control for phase protection. In addition, the TPG control has a separate zero-sequence circuit and settings for ground protection. Settings for ground trip vary from 10 A to 640 A in 10 A increments, and are field selectable by the user.

In some applications, such as a switchgear tap that feeds both underground and overhead feeders, the TPG control is necessary. As shown below, the F curve achieves coordination with both the phase and ground settings of the upline recloser.

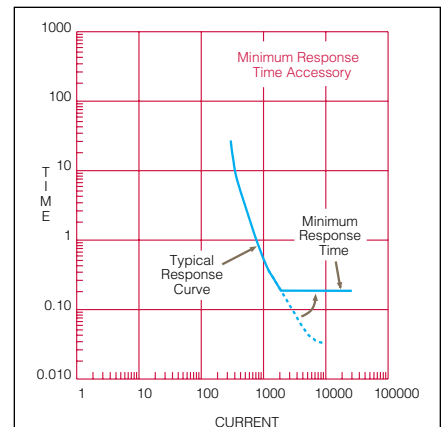


Tri-Phase Control Accessories

Minimum Response Time

The minimum response time accessory is used to achieve coordination between in-line protective interrupting devices, located where fault-level currents would normally cause simultaneous tripping.

The accessory inhibits tripping until a predetermined minimum time has elapsed; available minimum response times are adjustable at 0.050, 0.100, 0.145, 0.205, 0.260, 0.335, 0.405, 0.495, or 0.580 seconds. Refer to the example below.



Minimum Trip Multiplier

The minimum trip multiplier accessory allows the user to increase the programmed minimum trip setting, to a predetermined alternate setting, by operating a toggle switch. Typical applications for an alternate minimum trip settings include: preplanned or emergency load transfers, maintenance, or other routine switching conditions where line or feeder load temporarily exceeds the normally anticipated levels.

TPG Ground Trip

The TPG control includes phase and ground-fault protection for systems where increased sensitivity is required. If a ground-fault is detected, the control will begin a time-current curve delay sequence. At the completion of the programmed delay, a signal is issued to trip the vacuum fault interrupter mechanism.

Since the ground-fault curves are more sensitive than the phase curves, they can offer a distinct advantage in those special applications where increased sensitivity and speed in overcurrent protection are required. As a result, coordination with upstream devices (i.e., electronic reclosers) can be obtained where TCC coordination is difficult.

TPG SCADA Accessory

VFI switchgear, when ordered with the TPG control, may also be supplied with an optional SCADA accessory. The SCADA accessory provides the user with remote functionality, along with Status and Fault indicators, for each TPG-controlled vacuum fault interrupter mechanism. For additional information, refer to *Service Bulletin S285-75-1, Tri-Phase, TPG, and TPG with SCADA Electronic Control Installation and Operation Instructions*.

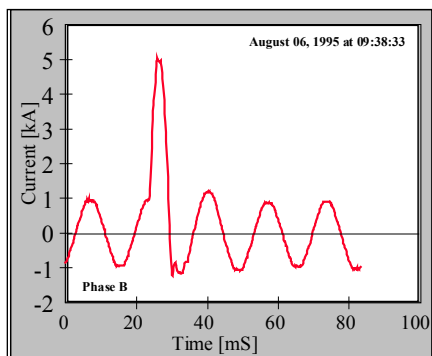


Figure 12.
Typical self-clearing fault detected by the iDP-210 relay ICSF algorithm.



Figure 13.
The iDP-210 is a member of Cooper Power Systems Edison Idea line of protective relays.

Edison Idea and IdeaPLUS™ Relays

IMPORTANT: For applications requiring SF₆ insulated switchgear, contact your Cooper Power Systems representative when selecting a relay/controller that has metering and protective elements requiring potential transformers.

Edison Idea and IdeaPLUS™ relays offer advanced protection and control options for the most demanding applications. Three different relays are available:

iDP-210 relay-provides multi-function protection elements for one source or tap. The iDP-210 relay is available in the Idea and IdeaPLUS™ platforms.

iTAP-265 relay-provides overcurrent protection for two three-phase taps. Available in IdeaPLUS platform only.

iTAP-260 relay-provides overcurrent protection for two three-phase taps with independent settings for each phase. Each phase can be independently tripped. Available in IdeaPLUS platform only.

Edison Idea and IdeaPLUS relays meet all applicable relay standards, including IEEE Std C37.90™-2005 and IEEE Std 1547™-2003 standards.

All relays include the following features and functions:

- Incipient Cable Splice Fault (ICSF) Detector
- Sequence of Event recorder with capacity to store the most recent 250 events in non-volatile memory

- Oscillography for fault analysis
- Programmable Data Profiler to record any combination of the available metering data
- Metering – instantaneous current, voltage, power factor, power, energy, demand, and harmonics
- Communications protocols shall include DNP3 via serial and TCP/IP, and Modbus via serial
- Graphical programming environment for custom logic and communication point maps
- Virtual Test Set™ for testing relay settings without the need for an external test set
- Integral breaker Interface panel, including illuminated Trip and Close pushbuttons, Close Inhibit switch, and close circuit disable link
- Twenty-five front panel LED targets to indicate relay status

iDP-210 Feeder Protection Relay

The iDP-210 is a full-featured relay suitable for a variety of protection applications, including source protection, feeder protection, and distributed generation inter-ties. Integral motor control logic for the VFI switchgear operator is included as standard. The protective elements in the iDP-210 relay are listed below.

- Phase instantaneous, definite time, and inverse time overcurrent (50/51)
- Ground instantaneous, definite time, and inverse time overcurrent (50N/51N)
- Negative Sequence instantaneous,

- definite time, and inverse time overcurrent (50Q/51Q)
- Directional phase, ground, and negative sequence elements (67P, 67N, 67Q)
- Reverse Power (32)
- Voltage elements: Definite time undervoltage (27), Definite time overvoltage (59), Negative sequence, and zero sequence overvoltage (59N)
- Frequency elements: definite time underfrequency (81U) and definite time overfrequency (81O)
- Sync-check (25)
- Highly configurable gaur shot recloser (79)
- Breaker failure (BF52)

iTAP-265 Dual Overcurrent Relay

The iTAP-265 relay provides overcurrent protection for two three-phase taps. Additional functionality can be programmed in the IDEA Workbench feature of ProView™ software.

- Phase instantaneous/definite time, and inverse time overcurrent (50/51) for each three-phase tap
- Ground instantaneous/definite time, and inverse time overcurrent (50N/51N) for each three-phase tap

iTAP-260 Dual Overcurrent Relay

The iTAP-260 relay provides overcurrent protection for two tap with independent settings for each phase. Additional functionality can be programmed in the IDEA Workbench feature of ProView software.

- Phase instantaneous/definite time, and inverse time overcurrent (50/51) for each phase. Six elements total
- Ground instantaneous/definite time, and inverse time overcurrent (50N/51N) for each phase. Two elements total.

Customize with the IDEA Workbench

Edison Idea and IdeaPLUS relays are fully functional relays, ready to use right out of the box. However, there are applications where custom control logic, or custom functions need to be added to the relay. The IDEA Workbench is a revolutionary graphical software programming environment which permits the user to customize the relays.

- Add new features or protective functions by means of IDEA Workbench Custom Modules. These operate in the same fashion as the plug-ins for popular internet browsers. your investment in the relay is protected as future needs and developments may be addressed through new Custom Modules.
- Create custom control and protection logic using over 400 programming signals and tools, all selectable from drag-off Toolboxes. Logic created suing these tools can then be saved as Custom Modules to be reused or shared with associates.
- Monitor and control practically every aspect of the relay's operation
- Create custom metering and measurement quantities
- Create custom sequence of event records
- Configure communication protocols to match existing SCADA system mappings

The IDEA Workbench offers the user the ability to rapidly and accurately create customizations by working the way the engineer thinks, by using logic diagram and flowchart construction methods. No equation-based or command-based logic programming is required.

The IDEA Workbench also addresses some of the more difficult questions associated with custom relay programming, namely:

Clarity: Compared to that offered by equation and command based

programming techniques, graphical programming results in customizations whose operation is intuitive.

Testing: ProView provides a Virtual Test Set (VTS), which can be used to test the developed logic with realistic fault signals. During test, the logic diagrams become “live” showing the state of all variables, logic gates, contacts, counters, etc. To avoid any question of how the custom logic interacts with the relay itself, the VTS environment models the entire relay in addition to the custom programming. Unlike other programming environments, the IDEA Workbench does not require the user to have an actual relay or relay test set on hand to verify the proper operation of the programmed logic.

Documentation: Notes regarding how the custom logic operates may be embedded within the IDEA Workbench. This improves the ability of others to quickly understand how the logic is designed to work. Links to external files may also be embedded in the IDEA Workbench, providing fast access to larger documents stored on company's network servers.

Portability: If the original data files are lost, the entire IDEA Workbench may be uploaded from the relay, complete with logic diagrams, embedded notes and external reference links.

Event Records and Analysis Tools

The iDP-210 relay shares the same event records and analysis tools as all Edison Idea relays. The Edison Idea allows for the display of event

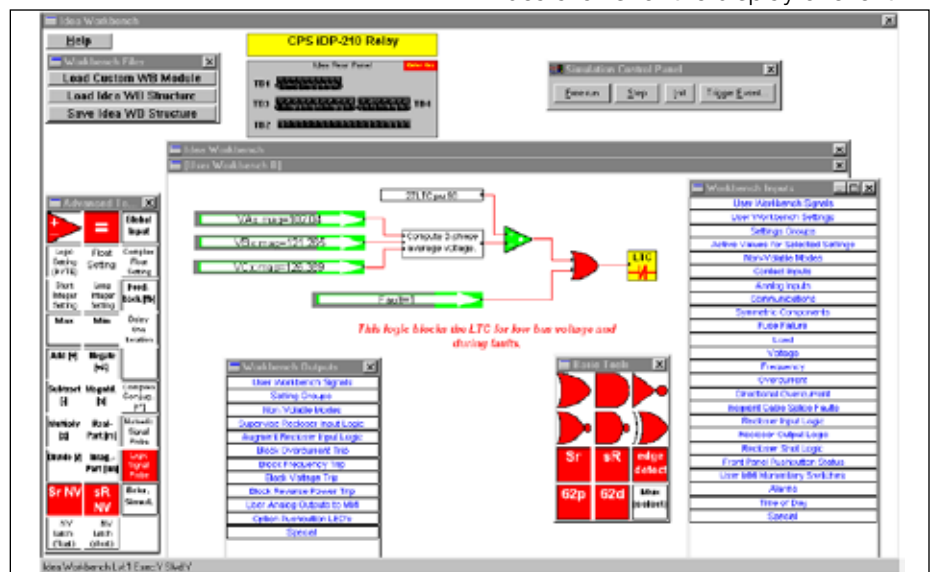


Figure 14. The IDEA Workbench graphical customization environment.

records in a variety of formats including waveforms (oscillography), magnitude plots, phasor diagrams, symmetrical component diagrams and more. ProView, the software for the Edison Idea relay, also provides a unique Application Diagram View that provides a one-screen view of everything that is going on in the relay. Many of these event views are also available in On-Line View mode, where it is possible to monitor the status of the relay in real-time, including phasor diagrams, which is ideal for verifying CT phasing during commissioning. The iDP-210 relay also includes distance to fault indication.

Relay Replay™

To evaluate the effect different settings would have on the relay, the Relay Replay™ feature of the Edison Idea software allows the user to make any number of setting changes and replay an existing event using these new settings without the need for an actual relay or expensive test equipment. The operation of every aspect of the relay's performance, from which elements pick-up, the response time of those elements that do and the operation of any custom programming made via the IDEA Workbench can be observed. This tool provides unprecedented "what-if" analysis capabilities.

Virtual Test Set (VTS)

To evaluate settings against any arbitrary fault, the Edison Idea software permits the user to create a virtual event record through use of the software's VTS feature. The VTS allows complete control over:

- Pre-fault and post-fault voltage and current levels
- Selection of phase-ground, phase-phase, phase-phase-ground and three-phase fault types
- Fault duration
- Selection of system and fault impedances
- Selection of DC time constant
- Control over fault dynamics to verify reclosing sequences and sequence coordination
- Control of frequency change, rate of change, and acceleration during faults
- Control over simulated breaker open and close times
- Voltage and current parameters derived from a built-in power system model or entered manually.

Communications

Both Modbus RTU and DNP 3.0 communication protocols are included with the iDP-210 relay. A Communications Workbench™ provides the user the ability to customize communication maps, add or delete information, add control points, and even create new signals to be brought out through communications. The iDP-210 relay features two RS-232 auto-baud (57600 kbps max) communication ports and one port configurable for RS-485, serial fiber optic, and various Ethernet options (RJ-45, multi-mode fiber, single-mode fiber). Contact your Cooper Power Systems representative for availability of other communication protocols.

Incipient Cable Splice Fault Detector (ICSF)

One of the most common causes of buried cable failure is from moisture ingress to buried cable splices. When sufficient water accumulates in the splice, a line-to-ground fault briefly occurs. The fault is cleared as the water is suddenly converted in to steam. Over time, the insulation is damaged and the cable splice eventually fails. The iDP-210 relay contains an algorithm to recognize the unique waveform characteristics of these self-clearing faults. See Figure 12. By counting how often these events occur over a moving time window, the iDP-210 relays are able to give advance notice of pending cable splice failures. This permits cable maintenance to be scheduled rather than addressed on an emergency basis.

Overcurrent Protection

The iDP-210 relay offers inverse time, definite time (2 levels) and instantaneous elements for phase, residual and negative sequence overcurrent protection. An additional definite time ground overcurrent element is provided for a separate zero-sequence flux summing CT. This fourth current channel input may also be ordered in a sensitive earth fault version which may be set as low as 0.005 A secondary. Each overcurrent element may be independently selected to be non-directional, forward- or reverse-directional. Inverse time elements may be set for disk-like or instantaneous reset characteristics. Complete fuse-fail detection logic is also included to selectively non-directionalize or disable directional elements during loss of bus potential.

Motor Operators

VFI switchgear may be specified with motor operators and an associated control to allow for local or remote opening and closing of the switches and vacuum fault interrupters via SCADA command.

Motor control is available either via the Edison Idea relays or with a separate DC Motor Controller.

Edison Idea relays can control up to two (2) individual motors on the operating handles. With this option, the motor control is integral to the relay.

The stand alone DC Motor Controller may operate up to six (6) individual motors on the operating handles. Additional motor controllers can be supplied if more than six (6) motors are required.

Applicable Standards

IEEE Std C37.74™-2003 standard, Standard Requirements for Subsurface, Vault, and Pad-Mounted Load-Interrupter Switchgear and Fused Load-Interrupter Switchgear for Alternating Current Systems Up to 38 kV.

IEEE Std C37.60™-2003 standard, Standard Requirements for Overhead, Pad-Mounted, Dry Vault, and Submersible Automatic Circuit Reclosers and Fault Interrupters for Alternating Current Systems Up to 38 kV.

IEEE Std C57.12.28™-2005 standard, Standard for Pad-Mounted Equipment—Enclosure Integrity.

IEEE Std C57.12.29™-2005 standard, Standard for Pad-Mounted Equipment—Enclosure Integrity for Coastal Environments – applicable when stainless steel construction is specified.

IEEE Std 386™-2006 standard, Standard for Separable Insulated Connector Systems for Power Distribution Systems Above 600 V.

IEEE Std C37.90™-2005 standard, Standard for Relays and Relay Systems Associated with Electric Power Apparatus.

IEEE Std C37.90.2™-2004 standard, Standard for Withstand Capability of Relay Systems to Radiated Electromagnetic Interference from Transceivers.

See page 24 for a list of additional information that is available from Cooper Power Systems.

SPECIFIERS GUIDE

Standard Unit Configuration:

- Mild-Steel construction
- Side-hinged (for pad-mounted style) doors
- Visible-Break not included
- Motor operators/provisions not included
- Three-Phase trip
- Tri-Phase control with “EF” TCC curve for the vacuum fault interrupter tap ways
- Bell Green/Munsell 7GY paint
- Ground Connector in each high voltage compartment
- 600 A deadbreak bushings on 600 A ways, 200 A bushing wells on 200 A ways

Example:

To specify a VFI Unit use the following procedure:

1. Build the descriptor by completing the fields based on the Switchgear requirements:

For example, **KPDE-VF9-32** is the descriptor for the following standard unit:

- **Pad-Mounted, Double-Sided unit**
- **E200 Fluid insulation**
- **15 kV, 600 A deadbreak bushings on source ways, 200 A loadbreak bushing wells on tap ways**
- **Model 9 - Two switched source ways and Two vacuum fault interrupter protected Tap ways**
- **Mild-Steel construction**
- **Side-hinged doors**
- **Tri-phase control for the vacuum fault interrupter tap ways** (Tri-Phase control with “EF” TCC curve is the standard control that ships with the VFI unit. If a different control is required, select the appropriate control from Table 10 and the desired TCC curve from Table 11.)
- **Unit is of standard Bell Green/Munsell 7GY paint. If custom color is required, refer to Table 12.**

2. Identify the options or accessories for inclusion with the standard unit. Refer to Tables 7-21.

3. Submit the descriptor with a list of options and accessories to your Cooper Power Systems representative for a quotation.

TABLE 4
Constructing a VFI Switchgear Descriptor

Three-Phase* • 15, 25 and 35 kV Nominal
200 and 600** A Max Continuous • 12500‡ A Interrupting Rating
Pad-Mounted • Electronically Controlled • Vacuum Fault Interrupters
• Deadfront Construction

KP Unit Style

- KP** for Pad-Mounted style
- KV** for Vault-Mounted style (no cabinets)

D Unit configuration

- D** for Double-Sided configuration
- S** for Single-Sided configuration

E Insulating Medium

- O** for Mineral Oil insulation
- F** for Envirotemp™ FR3™ Fluid (consult factory)
- E** for E200 Fluid
- S** for SF₆ insulation

VF Type of unit

- VF** for VFI unit
- RV** for RVAC unit (model 13A & 10)

9 Model number of the unit

refer to column “model” in Table 4 for double-sided unit or for single-sided unit.

3 Unit Phase type

- 3** for Three-Phase unit
- 1** for Single-Phase unit

2 Bushing Configuration

Digit represents ampere rating of bushing and voltage rating of gear per Table 5, below.

KP D E - VF 9- 3 2 is the required descriptor†

TABLE 5
Bushing Configuration

Voltage Rating	Amperage Rating (Source/Tap)		
	600 A/600 A	600 A/200 A	200 A/200 A
15 kV	1	2	3
25 kV	4	5	6
35 kV	7	8	9

* Single-Phase units available. Consult Factory.

** For 900 A continuous rating. Consult Factory.

‡ For 16000 A interrupting rating. Consult Factory.

† The descriptor is not the catalog number, but a shorthand method of describing the unit.

TABLE 6
Basic Models

Model*	One-Line Diagram**	Nominal Voltage (kV)	DOUBLE-SIDED, FRONT & BACK ACCESS		
			OIL INSULATED	E200 INSULATED†	SF ₆ INSULATED
			Descriptor	Descriptor	Descriptor
5		15	KPDO-VF5-32	KPDE-VF5-32	KPDS-VF5-32
		25	KPDO-VF5-35	KPDE-VF5-35	KPDS-VF5-35
		35	KPDO-VF5-38	KPDE-VF5-38	KPDS-VF5-38
6		15	KPDO-VF6-32	KPDE-VF6-32	KPDS-VF6-32
		25	KPDO-VF6-35	KPDE-VF6-35	KPDS-VF6-35
		35	KPDO-VF6-38	KPDE-VF6-38	KPDS-VF6-38
7		15	KPDO-VF7-32	KPDF-VF7-32	KPDS-VF7-32
		25	KPDO-VF7-35	KPDE-VF7-35	KPDS-VF7-35
		35	KPDO-VF7-38	KPDE-VF7-38	KPDS-VF7-38
13A ‡		15	KPDO-RV13A-32	KPDE-RV13A-32	KPDS-RV13A-32
		25	KPDO-RV13A-35	KPDE-RV13A-35	KPDS-RV13A-35
		35	KPDO-RV13A-38	KPDE-RV13A-38	KPDS-RV13A-38
9		15	KPDO-VF9-32	KPDE-VF9-32	KPDS-VF9-32
		25	KPDO-VF9-35	KPDE-VF9-35	KPDS-VF9-35
		35	KPDO-VF9-38	KPDE-VF9-38	KPDS-VF9-38
9T		15	KPDO-VF9T-32	KPDE-VF9T-32	KPDS-VF9T-32
		25	KPDO-VF9T-35	KPDE-VF9T-35	KPDS-VF9T-35
		35	KPDO-VF9T-38	KPDE-VF9T-38	KPDS-VF9T-38
10 ‡		15	KPDO-RV10-32	KPDE-RV10-32	KPDS-RV10-32
		25	KPDO-RV10-35	KPDE-RV10-35	KPDS-RV10-35
		35	KPDO-RV10-38	KPDE-RV10-38	KPDS-RV10-38
11		15	KPDO-VF11-32	KPDE-VF11-32	KPDS-VF11-32
		25	KPDO-VF11-35	KPDE-VF11-35	KPDS-VF11-35
		35	KPDO-VF11-38	KPDE-VF11-38	KPDS-VF11-38
12		15	KPDO-VF12-32	KPDE-VF12-32	KPDS-VF12-32
		25	KPDO-VF12-35	KPDE-VF12-35	KPDS-VF12-35
		35	KPDO-VF12-38	KPDE-VF12-38	KPDS-VF12-38
14		15	KPDO-VF14-32	KPDE-VF14-32	KPDS-VF14-32
		25	KPDO-VF14-35	KPDE-VF14-35	KPDS-VF14-35
		35	KPDO-VF14-38	KPDE-VF14-38	KPDS-VF14-38
5W2		15	KPDO-VF5W2-32	KPDE-VF5W2-32	KPDS-VF5W2-32
		25	KPDO-VF5W2-35	KPDE-VF5W2-35	KPDS-VF5W2-35
		35	KPDO-VF5W2-38	KPDE-VF5W2-38	KPDS-VF5W2-38
6W2		15	KPDO-VF6W2-32	KPDE-VF6W2-32	KPDS-VF6W2-32
		25	KPDO-VF6W2-35	KPDE-VF6W2-35	KPDS-VF6W2-35
		35	KPDO-VF6W2-38	KPDE-VF6W2-38	KPDS-VF6W2-38
6W3		15	KPDO-VF6W3-32	KPDE-VF6W3-32	KPDS-VF6W3-32
		25	KPDO-VF6W3-35	KPDE-VF6W3-35	KPDS-VF6W3-35
		35	KPDO-VF6W3-38	KPDE-VF6W3-38	KPDS-VF6W3-38

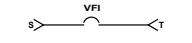
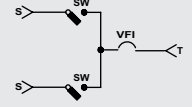
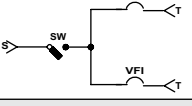
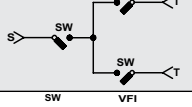
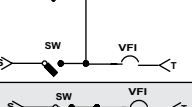
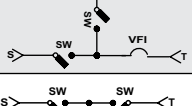
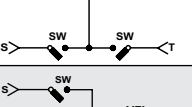
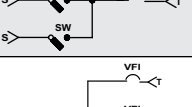
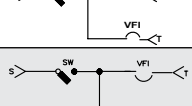
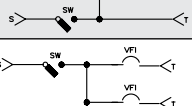
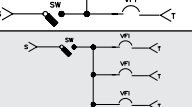
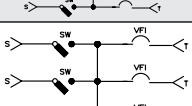
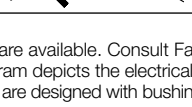
* Other models are available. Consult Factory.

** One-Line Diagram depicts the electrical connectivity, not the physical arrangement. Standard "source" and "tap" designation indicated by "S" and "T" on one-line diagrams.

‡ RVAC Models

† Envirotemp™ FR3™ fluid insulation is available. Consult Factory.

TABLE 6
Basic Models, continued

Model*	One-Line Diagram**	Nominal Voltage (kV)	SINGLE-SIDED, COMPACT ¹ FRONT ACCESS		
			OIL INSULATED	E200 INSULATED†	SF ₆ INSULATED
			Descriptor	Descriptor	Descriptor
5		15	KPSO-VF5-32	KPSE-VF5-32	KPSS-VF5-32
		25	KPSO-VF5-35	KPSE-VF5-35	KPSS-VF5-35
		35	KPSO-VF5-38	KPSE-VF5-38	KPSS-VF5-38
6		15	KPSO-VF6-32	KPSE-VF6-32	KPSS-VF6-32
		25	KPSO-VF6-35	KPSE-VF6-35	KPSS-VF6-35
		35	KPSO-VF6-38	KPSE-VF6-38	KPSS-VF6-38
7		15	KPSO-VF7-32	KPSE-VF7-32	KPSS-VF7-32
		25	KPSO-VF7-35	KPSE-VF7-35	KPSS-VF7-35
		35	KPSO-VF7-38	KPSE-VF7-38	KPSS-VF7-38
13A ‡		15	KPSO-RV13A-32	KPSE-RV13A-32	KPSS-RV13A-32
		25	KPSO-RV13A-35	KPSE-RV13A-35	KPSS-RV13A-35
		35	KPSO-RV13A-38	KPSE-RV13A-38	KPSS-RV13A-38
9		15	KPSO-VF9-32	KPSE-VF9-32	KPSS-VF9-32
		25	KPSO-VF9-35	KPSE-VF9-35	KPSS-VF9-35
		35	KPSO-VF9-38	KPSE-VF9-38	KPSS-VF9-38
9T		15	KPSO-VF9T-32	KPSE-VF9T-32	KPSS-VF9T-32
		25	KPSO-VF9T-35	KPSE-VF9T-35	KPSS-VF9T-35
		35	KPSO-VF9T-38	KPSE-VF9T-38	KPSS-VF9T-38
10 ‡		15	KPSO-RV10-32	KPSE-RV10-32	KPSS-RV10-32
		25	KPSO-RV10-35	KPSE-RV10-35	KPSS-RV10-35
		35	KPSO-RV10-38	KPSE-RV10-38	KPSS-RV10-38
11		15	KPSO-VFT11-32	KPSE-VF11-32	KPSS-VF11-32
		25	KPSO-VFT11-35	KPSE-VF11-35	KPSS-VF11-35
		35	KPSO-VFT11-38	KPSE-VF11-38	KPSS-VF11-38
12		15	KPSO-VF12-32	KPSE-VF12-32	KPSS-VF12-32
		25	KPSO-VF12-35	KPSE-VF12-35	KPSS-VF12-35
		35	KPSO-VF12-38	KPSE-VF12-38	KPSS-VF12-38
14		15	KPSO-VF14-32	KPSE-VF14-32	KPSS-VF14-32
		25	KPSO-VF14-35	KPSE-VF14-35	KPSS-VF14-35
		35	KPSO-VF14-38	KPSE-VF14-38	KPSS-VF14-38
5W2		15	KPSO-VF5W2-32	KPSE-VF5W2-32	KPSS-VF5W2-32
		25	KPSO-VF5W2-35	KPSE-VF5W2-35	KPSS-VF5W2-35
		35	KPSO-VF5W2-38	KPSE-VF5W2-38	KPSS-VF5W2-38
6W2		15	KPSO-VF6W2-32	KPSE-VF6W2-32	KPSS-VF6W2-32
		25	KPSO-VF6W2-35	KPSE-VF6W2-35	KPSS-VF6W2-35
		35	KPSO-VF6W2-38	KPSE-VF6W2-38	KPSS-VF6W2-38
6W3		15	KPSO-VF6W3-32	KPSE-VF6W3-32	KPSS-VF6W3-32
		25	KPSO-VF6W3-35	KPSE-VF6W3-35	KPSS-VF6W3-35
		35	KPSO-VF6W3-38	KPSE-VF6W3-38	KPSS-VF6W3-38

* Other models are available. Consult Factory.

** One-Line Diagram depicts the electrical connectivity, not the physical arrangement. Standard "source" and "tap" designation indicated by "S" and "T" on one-line diagrams.

¹ Compact units are designed with bushings in a diagonal fashion. Models 5, 6, 7, 13A, 9, 10, 11, 12, and 14 can be designed single-sided with in-line bushings. Consult Factory.

‡ RVAC Models

† Envirotemp™ FR3™ fluid insulation is available. Consult Factory.

OPTIONAL FEATURES

TABLE 7

Vacuum Fault Interrupter Operation

Type	Description	Location
Vacuum Fault Interrupter Type (select One)	Three-Phase Ganged Trip (STANDARD)	All Fault Interrupters
	Single-Phase Trip	All Fault Interrupters
	Mixture of Single-Phase and Three-Phase Trip	Specify location for each type

TABLE 8

Visible-Break Switch* Options

Description	Visible-Break Positions
No Visible-Break (STANDARD)	N/A
Two-position Visible-Break—close-open	All Source ways
	All Source & Tap ways
Three-position Visible-Break—close-open-ground	All Source ways
	All Source & Tap ways

* Visible-Break Switch available only for double-sided, fluid-filled switchgear.

TABLE 9

Bushing Options

Current Rating	Description
200 A Ways (select only one)	Bushing wells (STANDARD)
	Bushing wells with loadbreak inserts**
	Single-piece large interface, integral, loadbreak bushings*
600 A Ways (select only one)	600 A deadbreak bushings (STANDARD)
	PUSH-OP™ bushings
	U-OP™ systems with aluminum Visible-Break Junctions & U-connectors**
	U-OP provisions**
600 A & 200 A	Externally Replaceable Bushing/Wells (on all ways)†

Note: Aluminum is standard for bushing material.

* Only for 35 kV units, Cooper Power Systems large interface design.

** Only for 15, 25 kV units

† All SF6 units include this feature at no-charge.

TABLE 10

Controls*‡

Control Type	Overcurrent	Ground	Metering	SCADA	Comms	Advanced Functions
Tri-Phase control (STANDARD)	X					
TPG control (Tri-Phase control with ground)	X	X				
TPG with SCADA	X	X		X		
Edison Idea iTAP-265 relay (Three-Phase Trip)	X	X	X**	X	X	
Edison Idea iTAP-260 relay (Single-Phase Trip)	X	X	X**	X	X	
Edison Idea iDP-210 relay	X	X	X**	X	X	X**

* Consult factory for automation options using advanced controllers and communications.

** For metering and advanced functions requiring potential transformers in SF₆ insulated switchgear, contact your Cooper Power Systems representative.

‡ Select the TCC curve and the optional Minimum Response Time curve from Table 11.

**TABLE 11
Tri-Phase/TPG Control Options**

Time-Current Curve Card (TCC) (select only one)	EF Curve (STANDARD)
	KF Curve
	TF Curve
	H Curve
	F Curve
Minimum Response Timing Accessory (select only one)	EFR Curve (STANDARD)
	KFR Curve
	TFR Curve
	HR Curve
	FR Curve
Ground Trip Block Switch	for TPG only
CT Shorting Switch	for TPG only

**TABLE 12
Construction**

Tank Style	Material	Construction
Vault-Mounted Style*	Tank Material	Mild Steel construction with non-corrosive hardware (STANDARD)
		304L Stainless steel construction
Pad-Mounted Style	Tank/Cabinet Material	Mild Steel construction with non-corrosive hardware (STANDARD)
		304L Stainless steel construction
Paint color	Bell Green/Munsell 7GY (STANDARD)	
	Other paint color, top coat on external surfaces only (specify the Federal Spec Paint number)	

* Change first two digits of descriptor from Table 4 from "KP" to "KV" as shown on page 8.

**TABLE 13
Distribution Automation***

Description	Motor Operator Positions
No motor operators/provisions (STANDARD)	N/A
Motor operator provisions	Specify the ways: Source, Tap, or All
Motor operators**	

* Advanced automation and control options are available. Consult Factory.

** Motor operators require semaphores.

**TABLE 14
Auxiliary Switch**

Type	Position
Two-Stage Auxiliary Switch	Specify the ways: Source, Tap, or All

**TABLE 15
Indicators**

Description	Indicator Positions
Operation counter	Specify the ways: Source, Tap, or All
Semaphore*	Specify the ways: Source, Tap, or All

*Position indicator linked directly to operating mechanism and viewable through tank window.

TABLE 16
Grounding Options (select only one)

Ground Stud (STANDARD)
1/2" Round copper ground-bus
3" stand-off bracket for 1/2" round bus
NEMA® Ground Pad (welded to tank)
Flat copper ground-bus

TABLE 17
Fault Indicator Provisions (select only one)

No Fault Indicator provisions
Provisions for Fault Circuit Indicators (FCI) (1.06" dia. hole with removable SS backing plate)*
Provisions for S.T.A.R.™ FCI with large FISHEYE™
Provisions for S.T.A.R. FCI with small remote
Provisions for LED Display Indicator

* Accommodates future installation of S.T.A.R. FCI type indicators

TABLE 18
Service Items

Description	
1" drain plug with 3/8" sampler (STANDARD)*	Select only one
1" drain valve with 3/8" sampler*	
Penta-head door bolt (STANDARD)	Select only one
Hex-head door bolt	

* Not applicable to SF₆ units

TABLE 19
Service Items-Accessories

Description	
SF ₆ refill kit; hoses, valves, regulator	Select only one
SF ₆ refill kit; hoses and valves (without regulator)	
Bracket to convert single-phase trip unit into three-phase trip unit	Select only one (only for units with single-phase trip ways)
Hotstick tool for three-phase manual operation of single-phase trip unit	

* Prices listed are for all Models

TABLE 20
Key Interlocks

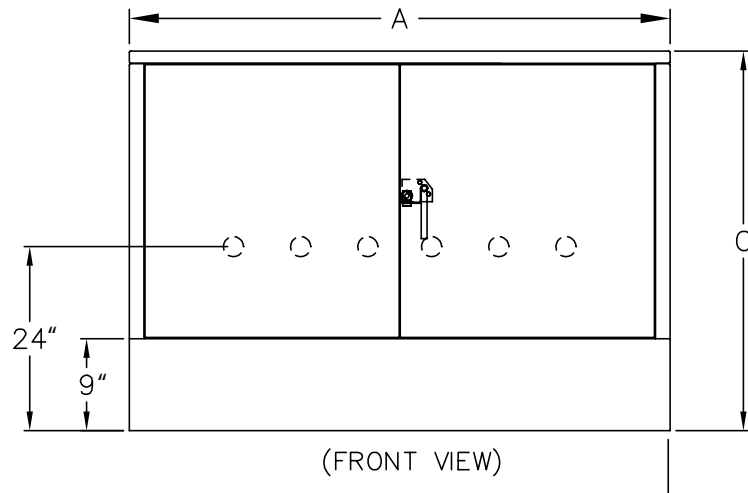
Description
Provisions for key interlocks
Key interlocks to prevent paralleling of source 1 and source 2 *

* Furnish name of ultimate user at time of ordering

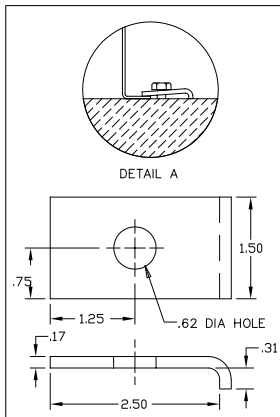
TABLE 21
Decals

Danger High Voltage	Specify Location
Internal Mr. Ouch, bilingual	
External Mr. Ouch, bilingual	
Non PCB	

DIMENSIONS



Detail A



Note: Detail A is the same for all units.

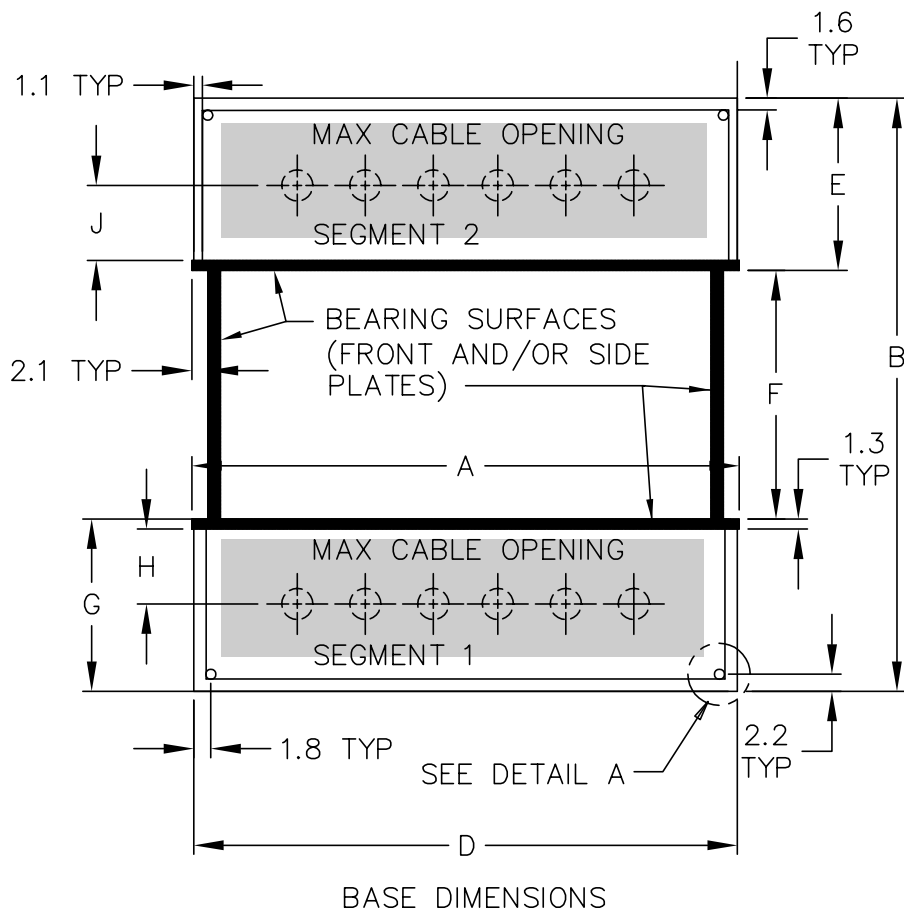


Figure 15.
Double-Sided VFI Switchgear (Without Visible-Break Switch).

TABLE 22
Double-Sided VFI Switchgear (Without Visible-Break Switch)
(All dimensions shown in inches).

kV Class	Dimension	Source/ Tap Current Ratings												Model
		600 A Segment 1, 600 A Segment 2				600 A Segment 1, 200 A Segment 2				200 A Segment 1, 200 A Segment 2				
		5	6 7 9 10* 11 13 A*	9T 10T*	12	5	6 7 9 10* 11 13 A*	9T 10T*	12	5	6 7 9 10* 11 13 A*	9T 10T*	12	
15 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	68.40	76.40	79.40	81.40	68.40	76.40	79.40	81.40	68.40	76.40	79.40	81.40	
	C	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	24.00	32.00	35.00	37.00	24.00	32.00	35.00	37.00	24.00	32.00	35.00	37.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	
	J	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	
25 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	68.40	76.40	79.40	81.40	68.40	76.40	79.40	81.40	68.40	76.40	79.40	81.40	
	C	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	24.00	32.00	35.00	37.00	24.00	32.00	35.00	37.00	24.00	32.00	35.00	37.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	8.00	8.00	8.00	8.00	
	J	5.20	5.20	5.20	5.20	8.00	8.00	8.00	8.00	8.00	8.00	8.00	8.00	
35 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	80.40	87.40	89.40	95.40	76.40	83.40	85.40	91.40	72.40	81.40	83.40	87.40	
	C	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	49.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	35.00	37.00	39.00	28.00	35.00	37.00	43.00	28.00	37.00	39.00	43.00	
	G	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	
	H	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	
	J	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	

* RVAC models. 'RVAC' is the nameplate designation for models with only load-break switches (no fault interrupters).
For dimensions of models not listed, consult factory.

Note: This table provides standard product dimensional information only. Dimensions are NOT for construction purposes. Foundation construction should comply with local building or construction codes as required. If needed, request engineering drawings for approval or drawings for record purposes with your order.

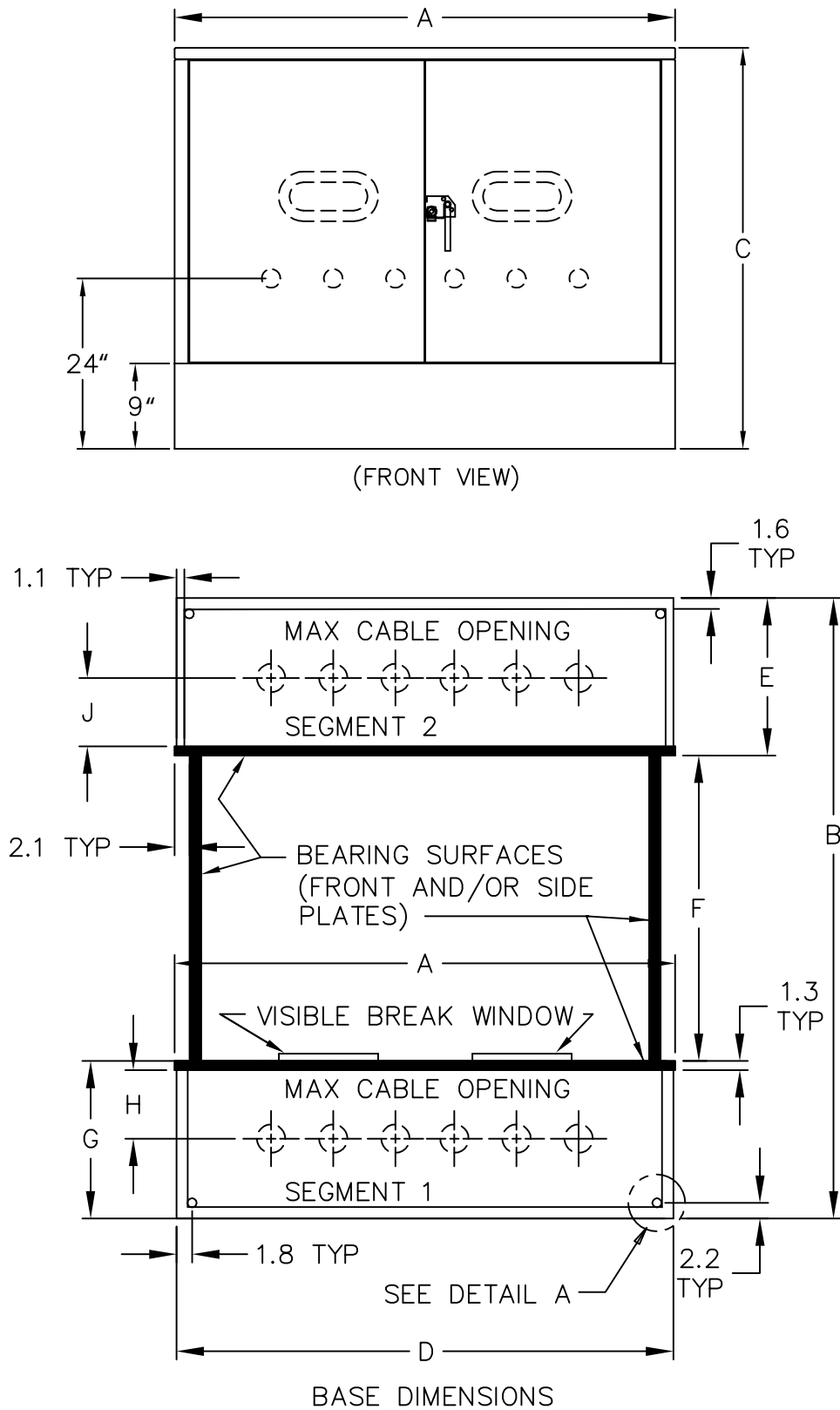


Figure 16.
Double-Sided VFI Switchgear (With Visible-Break Switch on Sources Only).

TABLE 23
Double-Sided VFI Switchgear (With Visible Break Switch on Sources Only)
(All dimensions shown in inches).

kV Class	Dimension	Source/ Tap Current Ratings															Model
		600 A Segment 1, 600 A Segment 2					600 A Segment 1, 200 A Segment 2					200 A Segment 1, 200 A Segment 2					
		5	6 7 9 10* 13A*	9T 10T*	11	12	5	6 7 9 10* 13A*	9T 10T*	11	12	5	6 7 9 10* 13A*	9T 10T*	11	12	
15 kV	A	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	
	B	72.40	87.40	90.40	87.40	90.40	72.40	87.40	90.40	87.40	90.40	72.40	87.40	90.40	87.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	6.80	
	J	5.20	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	
25 kV	A	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	
	B	72.40	87.40	90.40	87.40	90.40	72.40	87.40	90.40	87.40	90.40	72.40	87.40	90.40	87.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	8.00	8.00	8.00	8.00	8.00	
	J	5.20	5.20	5.20	5.20	5.20	8.00	8.00	6.80	8.00	6.80	8.00	8.00	8.00	8.00	8.00	
35 kV	A	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	40.50	70.50	84.50	70.50	70.50	
	B	80.40	95.40	98.40	95.40	98.40	76.40	91.40	94.40	91.40	94.40	72.40	87.40	90.40	87.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	40.00	70.00	84.00	70.00	70.00	
	E	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	28.00	37.00	43.00	43.00	43.00	
	G	26.00	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	8.75	
	J	6.20	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	

* RVAC models. 'RVAC' is the nameplate designation for models with only load-break switches (no fault interrupters).
 For dimensions of models not listed, consult factory.

Note: This table provides standard product dimensional information only. Dimensions are NOT for construction purposes. Foundation construction should comply with local building or construction codes as required. If needed, request engineering drawings for approval or drawings for record purposes with your order.

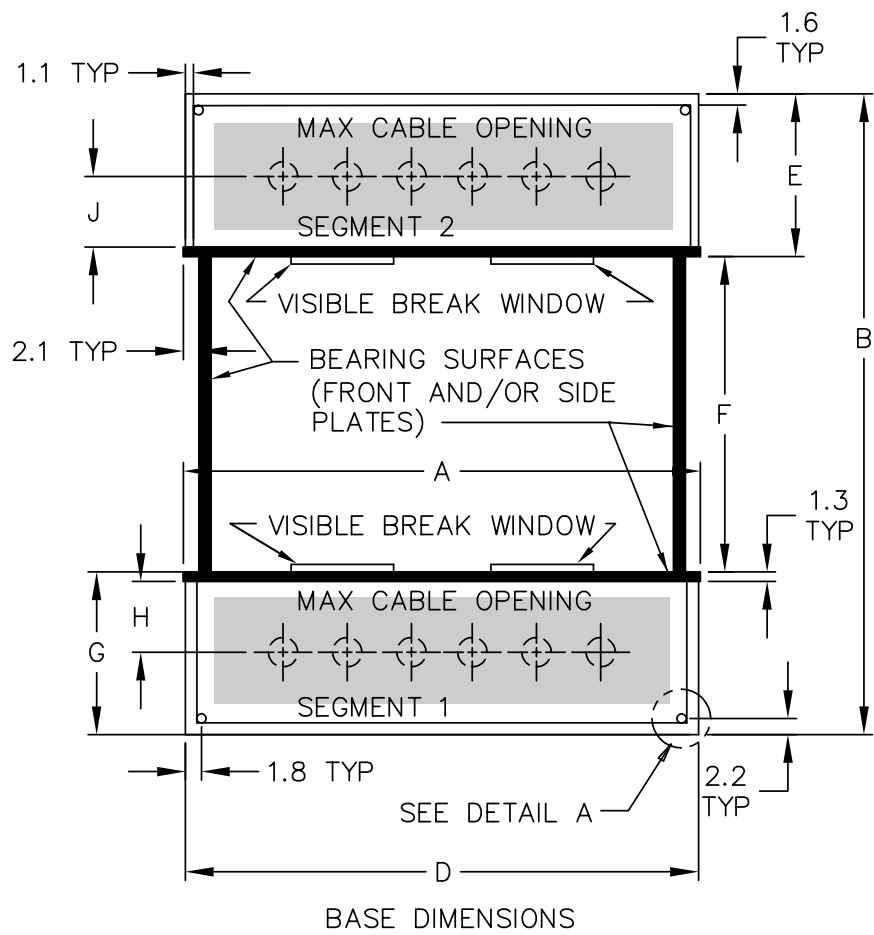
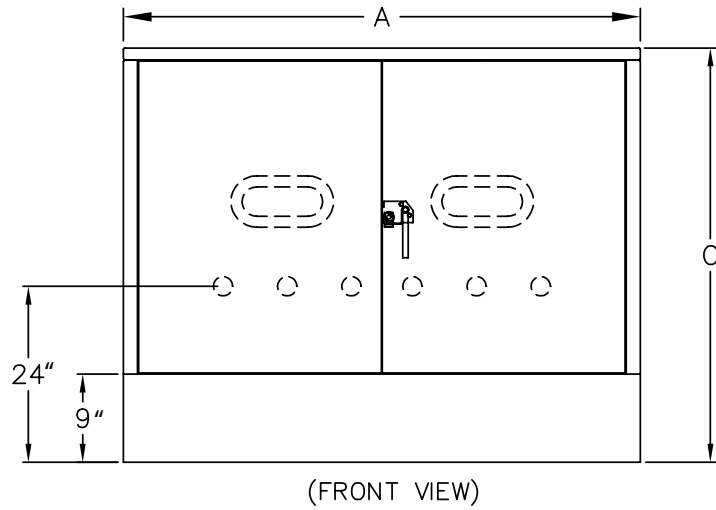


Figure 17.
Double-Sided VFI Switchgear (With Visible-Break Switches on all ways).

TABLE 24
Double-Sided VFI Switchgear (With Visible-Break Switches on all ways)
(All dimensions in inches).

kV Class	Dimension	Source/ Tap Current Ratings												Model
		600 A Segment 1, 600 A Segment 2				600 A Segment 1, 200 A Segment 2				200 A Segment 1, 200 A Segment 2				
		5	6 7 9 10* 11 13 A*	9T 10T*	12	5	6 7 9 10* 11 13 A*	9T 10T*	12	5	6 7 9 10* 11 13 A*	9T 10T*	12	
15 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	
	B	72.40	87.40	90.40	90.40	72.40	87.40	90.40	90.40	72.40	87.40	90.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	
	G	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	H	5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	
	J	5.20	5.20	5.20	5.20	6.80	6.80	6.80	6.80	6.80	6.80	6.80	6.80	
	25 kV	A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50
B		72.40	87.40	90.40	90.40	72.40	87.40	90.40	90.40	72.40	87.40	90.40	90.40	
C		56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
D		40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
E		22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
F		28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	
G		22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
H		5.20	5.20	5.20	5.20	5.20	5.20	5.20	5.20	8.00	8.00	8.00	8.00	
J		5.20	5.20	5.20	5.20	8.00	8.00	6.80	6.80	8.00	8.00	8.00	8.00	
35 kV		A	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50	40.50	70.50	84.50	70.50
	B	80.40	95.40	98.40	98.40	76.40	91.40	94.40	94.40	72.40	87.40	90.40	90.40	
	C	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	56.50	
	D	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	40.00	70.00	84.00	70.00	
	E	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	22.00	
	F	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	28.00	43.00	46.00	46.00	
	G	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	22.00	22.00	22.00	22.00	
	H	6.20	6.20	6.20	6.20	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	
	J	6.20	6.20	6.20	6.20	8.75	8.75	8.75	8.75	8.75	8.75	8.75	8.75	

* RVAC models. 'RVAC' is the nameplate designation for models with only load-break switches (no fault interrupters).
For dimensions of models not listed, consult factory.

Note: This table provides standard product dimensional information only. Dimensions are NOT for construction purposes. Foundation construction should comply with local building or construction codes as required. If needed, request engineering drawings for approval or drawings for record purposes with your order.

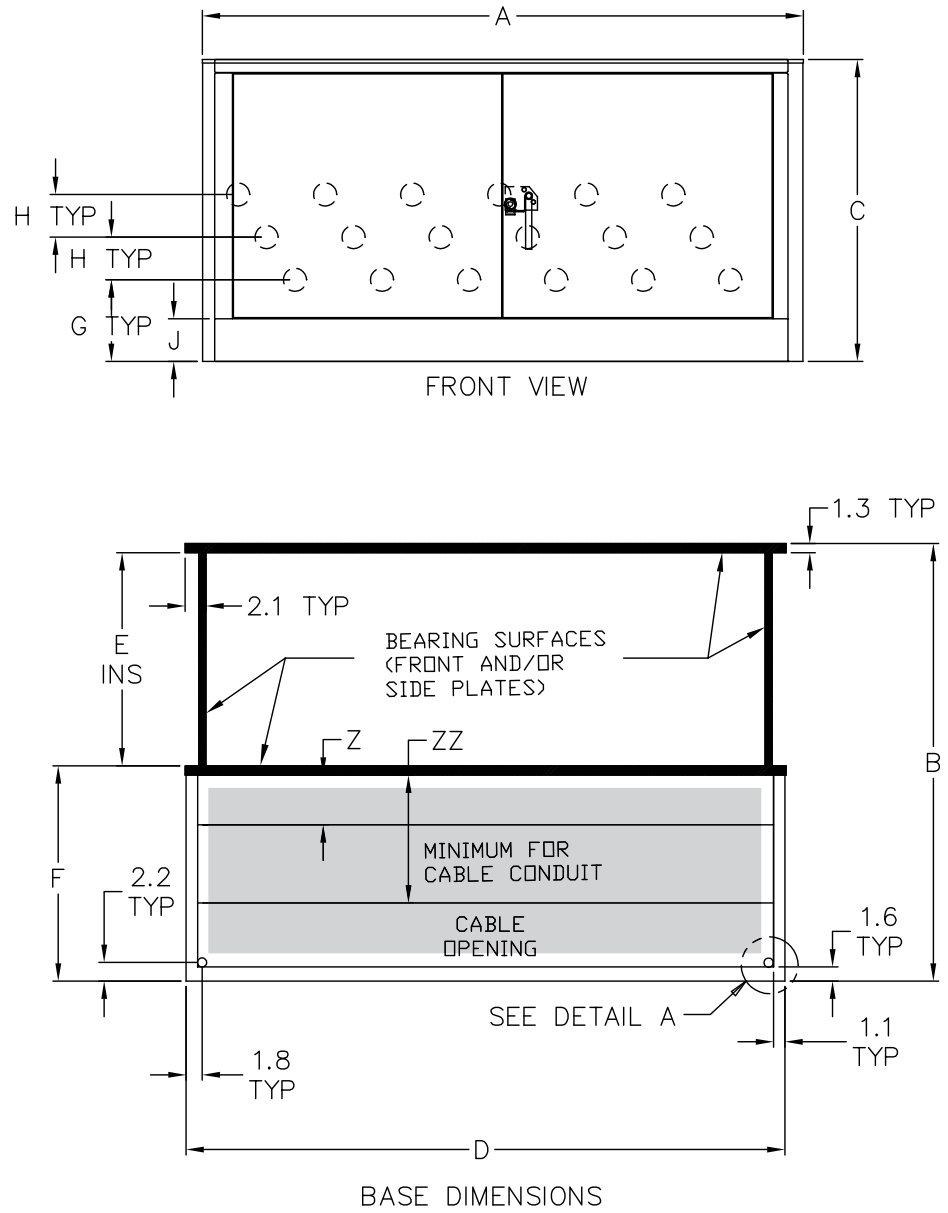


Figure 18.
Single-Sided Compact VFI Switchgear.

TABLE 25
Single-Sided Compact VFI Switchgear
(All dimensions shown in inches).

kV Class	Dimension	Source/ Tap Current Ratings				Model
		600 A		200 A		
		6 7 10* 13 A*	9 11 12	6 7 10* 13 A*	9 11 12	
15 kV	A	62.50	62.50	62.50	62.50	
	B	53.60	53.60	53.60	53.60	
	C	43.50	43.50	43.50	43.50	
	D	62.30	62.30	62.30	62.30	
	E	30.00	30.00	30.00	30.00	
	F	22.00	22.00	22.00	22.00	
	G	11.50	11.50	11.50	11.50	
	H	6.00	6.00	6.00	6.00	
	J	6.00	6.00	6.00	6.00	
	Z	3.00	3.00	5.00	5.00	
ZZ	7.00	7.00	9.00	9.00		
25 kV	A	62.50	62.50	62.50	62.50	
	B	53.60	53.60	53.60	53.60	
	C	43.50	43.50	43.50	43.50	
	D	62.30	62.30	62.30	62.30	
	E	30.00	30.00	30.00	30.00	
	F	22.00	22.00	22.00	22.00	
	G	11.50	11.50	11.50	11.50	
	H	6.00	6.00	6.00	6.00	
	J	6.00	6.00	6.00	6.00	
	Z	3.00	3.00	6.00	6.00	
ZZ	7.00	7.00	10.00	10.00		
35 kV	A	62.50	62.50	62.50	62.50	
	B	65.60	65.60	65.60	65.60	
	C	43.50	43.50	43.50	43.50	
	D	62.30	62.30	62.30	62.30	
	E	30.00	30.00	30.00	30.00	
	F	34.00	34.00	34.00	34.00	
	G	11.50	11.50	11.50	11.50	
	H	6.00	6.00	6.00	6.00	
	J	6.00	6.00	6.00	6.00	
	Z	4.00	4.00	6.75	6.75	
ZZ	8.00	8.00	10.75	10.75		

* RVAC models. 'RVAC' is the nameplate designation for models with only load-break switches (no fault interrupters).
For dimensions of models not listed, consult factory.

Note: This table provides standard product dimensional information only. Dimensions are NOT for construction purposes. Foundation construction should comply with local building or construction codes as required. If needed, request engineering drawings for approval or drawings for record purposes with your order.

Additional Information

165-210, iDP-210 Feeder Protection Relay

165-260, iTAP-260 Dual Overcurrent Relay

165-265, iTAP-265 Dual Overcurrent Relay

S285-10-1, VFI Oil-Insulated Installation Instructions

S285-10-2, VFI SF₆-Insulated, Vacuum Fault Interrupter; installation, Operation and Maintenance Instructions

S285-10-3, SF₆ Gas Top-Off Kit Operation Instructions

S285-10-4, Visible Break Switch Accessory Operation Instructions

S285-10-5, VFI Fault Interrupter w/ Tri-Phase Control Single-Phase Trip to Three-Phase Trip Conversion Kit Instructions

S285-10-7, VFI Tester Operation Instructions

S285-75-1, Kyle Tri-Phase, TPG, and TPG with SCADA Electronic Control Installation and Operation Instructions

B165-06047, iDP-210 Feeder Protection Relay Bulletin

B285-01041, VFI Underground Distribution Switchgear - Environmentally Preferred Switchgear

B285-09042, VFI Underground Distribution Switchgear Frequently Asked Questions

R285-10-1, Guide for Atmospheric Retrofilling of 38 kV (or lower) Fluid-filled Switchgear

B285-13011, Smart VFI for Solar Applications

B285-13012, Smart VFI Underground Distribution Switchgear

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One Cooper | www.cooperpower.com | Online



COOPER Power Systems

2300 Badger Drive
Waukesha, WI 53188 USA

**ATTACHMENT 8:
FINANCIAL SURETY/
DECOMMISSIONING PLAN**

DECOMMISSIONING PLAN

Ground-Mounted Solar Project

at

5 & 5R Hatfield Road

Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

1.1 INTRODUCTION

ZPT Energy Solutions II, LLC is committed to improving the environment around us and reducing our impact during and after our projects are constructed. For these reasons, the following decommissioning actions and activities are provided for future reference and planning.

1.2 SOLAR ENERGY PROJECT DECOMMISSIONING

Decommissioning and site activities that need to be considered to minimize environmental impacts include facility removal, land recontouring, and revegetation. Typical activities during the solar energy facility decommissioning and site reclamation phase include facility removal, breaking up of concrete pads and foundations, removal of access roads that are not maintained for other uses, recontouring the surface, and revegetation.

1.3 PROCESS

The following process is what ZPT Energy Solutions II, LLC would implement in order to decommission an active Photovoltaic system:

1. Contact local AHJ (authority having jurisdiction) and obtain a demolition permit.
2. Contact local power authority and schedule all exterior transformer interconnections to be disconnected and terminated.
3. Contact local power authority to remove the Photovoltaic production meter.
4. Place a temporary storage container at site to store all re-usable equipment and small tools.
5. Set main disconnect at panel integration to off position.
6. Set main inverter switch to off position.
7. Switch main DC disconnect to off position.
8. Disconnect all module strings at combiner boxes.
9. Disconnect all DC wiring at modules.
10. Remove and recycle all galvanized rigid conduit between building service and inverter.
11. Remove and recycle existing inverter.
12. Remove and recycle all AC copper wiring.
13. Remove and recycle all DC wiring between inverters and combiner boxes.
14. Remove existing end-of-life modules from system
 - a. Contact local PV recycling company to stage a storage container to accept and process end-of-life modules (see Section 1.4 below).
 - b. PV recycling firm will separate extruded aluminum frame from the semiconductor material and glass.
 - c. The extruded aluminum will be recycled.
 - d. The semiconductor material and glass will be crushed with a hammer mill to pieces smaller than 5mm.
 - e. Semiconductor films are removed in a slow rating leach drum in a process taking 4–6 hours. Weak sulfuric acid and hydrogen peroxide is added to the glass to achieve an optimal solid-liquid ratio. The films are etched from the glass during the leach cycle.
 - f. All glass material will be separated from the liquids in a classifier.
 - g. The material is then moved to a vibrating screen separating the glass from the larger ethylene vinyl acetate (EVA) pieces. The EVA is deposited into another

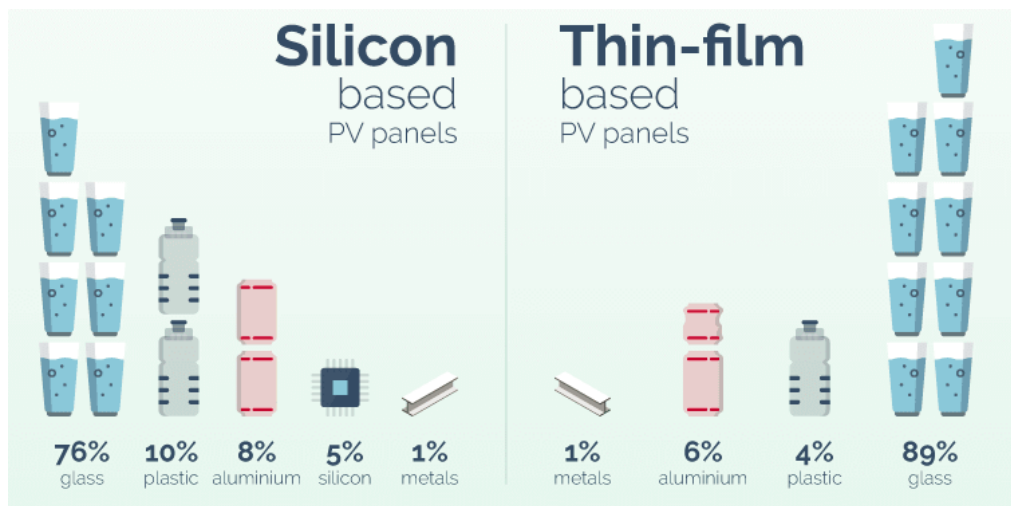
- conveyor and collected, whereas the glass falls through the screen to a chute where it is taken to the rinsing step.
- h. After being cleaned, the glass is deposited into containers for recycling and the rinse waters are pumped to a precipitation system for metal recovery.
 - i. The metal compounds are precipitated in three stages at increasing pH using sodium hydroxide. When the solids have settled and been made into a metal rich filter cake, it is sent off for processing by a third party where they can be processed to semiconductor grade raw materials for use in new solar modules.
15. Remove and recycle all gates and fencing.
 16. Begin disassembling racking system.
 17. Extract and remove screws/posts from below grade and recycle steel.
 18. Have a local recycler provide 30 yard roll off to place all discarded structural steel.
 19. Re-grade areas and fill open trenches and excavations with common borrow, as necessary.
 20. Loam and seed all disturbed areas.
 21. Substantially stabilize the site.

1.4 PHOTOVOLTAIC MODULE RECYCLING

Silicon solar modules are primarily composed of glass, plastic, and aluminum: three materials that are recycled in mass quantities.

Despite the recyclability of the modules, the process in which materials are separated can be tedious and requires advanced machinery. Here are the main steps involved in successfully recycling a silicon module:

1. Removing the aluminum frame (100% reusable)
2. Separating the glass along a conveyor belt (95% reusable)
3. Thermal processing at 500 degrees Celsius
 - o This allows for the evaporation of small plastic components and allows the cells to be easier separated.
4. Etching away silicon wafers and smelting them into reusable slabs (85% reusable)



Decommissioning Estimate
ZPTII-241 - Penny Johnson - 4.75MW DC

	Unit	Est. Qty.	Material/ Labor Cost	Salvage Labor	Material Recycle Val.	Net Salvage	Net Cost	Notes
Contractor Fees								
Mobilization	LS	1	-	-	-	-	-	
Supervisory/Management	LS	1	15,625	-	-	-	15,625	125 man hours @ \$125/hour
Electrical Disconnection	EA	1	2,960	-	-	-	2,960	32 hours of electrical labor @ \$80/hour to de-energize
Silt Fence	LF	5,800	14,500	-	-	-	14,500	\$2.50/LF
Permitting Fees	LS	1	-	-	-	-	-	No permit assumed
Subtotal			32,685	-	-	-	32,685	
Sitework								
Access Roads	SF		13,333	-	-	-	13,333	
Restoration Seeding	AC	22.0	27,500	-	-	-	27,500	Damaged areas only at \$1,250/AC
Fence Removal and Recycling	LF	3,800	2,033	-	-	-	2,033	100 LF/hr @ \$53.5/hr
Site Cleanup	LS	1	16,100	-	-	-	16,100	Labor and dumpster
Subtotal			58,966	-	-	-	58,966	
Racking Removed								
Remove and recycle piles	LB	2,042	1,821	-	-	-	1,821	60 piles per hour per crewmember @ \$53.5/hr
Remove and recycle racking tables	EA	510	2,274	-	(46,185)	(46,185)	(43,912)	12 tables per hour per crewmember @ \$53.5/hr
Subtotal			4,095	-	(46,185)	(46,185)		
Solar Modules Removed								
Remove modules	EA	14,924	13,307	-	-	-	13,307	Assume 60 modules per hour per crewmember @ \$53.5/hour
Subtotal			13,307	-	-	-	13,307	
AC & DC Wire Renewal								
DC/AC direct burial wire removal	LF	15,732	2,098	-	(3,146)	(3,146)	(1,049)	LF - Assume 600/hour removed/crewmember @ \$80/hr
AC overhead wire removal	EA	200	21	480	(40)	440	461	LF - Assume 100/hour removed/crewmember @ \$80/hr 3 phase
DC wire removal	LF	253,901	13,541	-	(25,390)	(25,390)	(11,849)	Assume 1500/hour removed @ \$80/hour
Interconnection pole removal	EA	4	240	-	-	-	960	Assume 3 hours per pole @ \$80/hour
Central inverter removal	EA	2	1,280	-	-	-	1,280	Crew of 4 removes 4/day @ \$80/hour
Transformer removal	EA	1	853	-	-	-	853.33	Crew of 4 removes 3/day @ \$80/hour
Subtotal			18,034	480	(28,576)	(28,096)	(9,343)	
Equipment Pad Removal								
Remove equipment pads	EA	4	12,000	-	-	-	12,000	\$3,000/pad
Subtotal			12,000	-	-	-	12,000	
Decommissioning subtotal								
			139,087	480	(74,762)	(74,282)	65,525	
Subcontractor markup								
	10%		13,909	-	(7,476)	-	6,432	
Total Decommissioning								
			152,995	480	(82,238)	(74,282)	71,957	
	Cost/kW AC		\$ 61.20				\$ 28.78	

**ATTACHMENT 9:
EMERGENCY RESPONSE PLAN**

**EMERGENCY
RESPONSE PLAN**
Ground-Mounted Solar Project
at
5 & 5R Hatfield Road
Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

1.1 EMERGENCY RESPONSE PLAN

In the event of an emergency, all local emergency response personnel will have full access to the proposed facility. Prior to the facility becoming operational, local fire departments and police stations will be provided keys to the utility locks which secure the site.

There will be clearly marked emergency shut-off switches on each inverter as well as a general shut-off switch to cut the utility connection to the entire array. Each string of the array will be laid-out in compliance with the approved spacing arrangement, allowing for the safe access of emergency personnel throughout the facility.

1.2 EMERGENCY SHUTDOWN PROCEDURE

1.2.1 EMERGENCY SHUTDOWN – INITIAL STEP

In an emergency, each inverter should be manually turned to the off position (this will require a key). Doing this will immediately open, or disconnect, the internal AC and DC contactors (if present) inside the inverter.

1.2.2 ISOLATION PROCEDURE – INVERTER PAD EQUIPMENT

TO ISOLATE THE INVERTER PAD SAFELY:

1. Shut the inverters off through a controlled shutdown.
2. Turn off all AC and DC disconnects that feed the pad. Follow the procedure in the LOTO section for opening electrical disconnects.
3. Use LOTO procedures to ensure the system remains off.
4. Always wear proper PPE and test for voltages with a properly rated meter to confirm the system is completely isolated.

1.2.3 ISOLATION PROCEDURE – FIELD COMBINER BOX

TO ISOLATE THE FIELD COMBINER BOXES SAFELY:

1. Turn off the inverters as described above.
2. Operate the switch of the combiner (if applicable) by turning the handle to the off position.
3. Use a DC clamp-on meter to confirm there is no current passing through the ungrounded conductors in the combiner box, and then open all of the fuses.
4. If further isolation of the box is needed, use the string diagrams to locate the homeruns (end connectors of the PV strings).
5. Use a DC clamp-on meter to confirm that the homerun does not have any current passing through it. Then, disconnect the string by opening the homerun positive and negative connectors and putting caps on the source circuit connectors.
6. Go back to the combiner box and use a voltmeter to confirm that each string has been successfully disconnected.

1.2.4 ISOLATION PROCEDURE – MODULES AND STRING WIRING

TO ISOLATE THE INDIVIDUAL MODULES SAFELY:

1. After turning off the inverter, switches, and combiner boxes and isolating the combiner boxes from the array, disconnect individual modules from the string.
2. Before disconnecting any string, use a DC clamp-on meter to confirm there is no current passing through the string.
3. Use the appropriate connector unlocking tool to disengage the module connector.
4. Repeat for each module to be isolated from the system.
5. If modules are removed from a string, even temporarily, technicians must ensure that the equipment grounding system remains intact for the remaining modules.

**ATTACHMENT 10:
HAZARDOUS MATERIALS AND SPILL
PREVENTION PLAN**

HAZARDOUS MATERIAL & SPILL PREVENTION PLAN

Ground-Mounted Solar Project

at

5 & 5R Hatfield Road

Williamsburg, Massachusetts

ZPT ENERGY SOLUTIONS II, LLC

1.1 HAZARDOUS MATERIALS

No hazardous materials will be permanently introduced or stored on-site as part of the solar array installation. The solar panels do not contain any hazardous materials and they will be mounted on stationary racking systems with no movable parts. The solar installation requires no lubricants, fuel or water for operation, and generates no wastewater requiring disposal.

The proposed transformers for the solar facility will contain a non-toxic, vegetable oil-based fluid (Envirotemp FR3 fluid) as a coolant. Envirotemp FR3 fluid is formulated from seed oils (>98.5% vegetable oil) and performance enhancing additives and colorant.

During construction, hazardous materials in the form of limited quantities of fuel (gasoline or diesel), lubricating and hydraulic oil, and coolants, will be temporary introduced on the site within the construction vehicles and equipment. Refueling protocols and spill preventive measures will be further detailed within the SWPPP to be provided prior to the start work.

1.2 SPILL PREVENTION PLAN

MATERIAL MANAGEMENT PRACTICES

The following are the material management, practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to stormwater runoff.

1.2.1 GOOD HOUSEKEEPING:

The following good housekeeping practices will be followed onsite during the construction project.

- An effort will be made to store only enough product required to do the job.
- All materials stored onsite will be stored in a neat, orderly manner in their appropriate containers and, if possible, under a roof or other enclosure.
- Products will be kept in their original containers with the original manufacturer's label.
- Manufacturer, local, and State recommendations for proper use and disposal shall be followed.
- Substances will not be mixed with one another unless recommended by the manufacturer.
- Whenever possible, all of a product will be used up before disposing of the container.
- The site superintendent will inspect daily to ensure proper use and disposal of materials onsite.

SPILL PREVENTION AND RESPONSE PLANS:

- Spill Control Practices shall be in conformance with the guidelines set forth in the National Pollutant Discharge Elimination System (NPDES) Stormwater Pollution Prevention Plan (SWPPP)

PROVISIONS FOR MAINTENANCE OF LAWNS, GARDENS, AND OTHER LANDSCAPED AREAS:

- Grass shall not be cut shorter than 2 to 3 inches and mulch clipping should be left on lawn as a natural fertilizer.
- The use of mulch shall be utilized where possible. Mulch helps retain water and prevents erosion.

REQUIREMENTS FOR STORAGE AND USE OF FERTILIZERS:

- Fertilizers used will be applied only in the minimum amounts recommended by the manufacturer. Once applied, fertilizer will be worked into the soil to limit exposure to storm water. Storage will be in a covered shed. The contents of any partially used bags of fertilizer will be transferred to a sealable plastic bin to avoid spills.
- Do not fertilize before a rainstorm.
- Consider using organic fertilizers. They release nutrients more slowly.

SNOW DISPOSAL AND PLOWING PLANS RELATIVE TO RESOURCE AREAS:

- Snow shall be plowed and stored on gravel, grass, or other permeable surfaces to allow filtration to occur.
- Once snow melts all sand salt and debris shall be extracted from surface and properly disposed of.
- Snow shall not be disposed of in any resource area or waterbody.
- Avoid disposing snow on top of storm drain catch basins or stormwater drainage swale.

1.2.2 HAZARDOUS PRODUCTS:

These practices are used to reduce the risks associated with hazardous materials.

- Products will be kept in original containers unless they are not re-sealable.
- Original labels and material safety data will be retained; they contain important product information.
- If surplus must be disposed of, manufacturer's or local and State recommended methods for proper disposal will be followed.

1.2.3 PRODUCT SPECIFIC PRACTICES:

The following product specific practices will be followed onsite:

Petroleum Products

All onsite vehicles will be monitored for leaks and receive regular preventive maintenance to reduce the chance of leakage. Petroleum product will be stored in tightly sealed containers which are clearly labeled.

Concrete Products

Concrete contractors should be encouraged, where possible, to use the washout facilities at their own plants or dispatch facilities.

If concrete washout or discharge of surplus concrete or drum wash water on the site is needed for emergency purposes only, then the following must comply:

- a) Do not wash out concrete trucks or equipment into storm drains, streets, gutters, uncontained areas, or streams.
- b) Washout area shall be located within the designated construction laydown area per the approved permit plans only and advertise the location with signs.
- c) Direct all washwater into a leak-proof container or leak-proof pit. The container or pit must be designed so that no overflows can occur due to inadequate sizing or precipitation. Provide adequate containment for the amount of wash water that will be used
- d) Inspect washout structures daily to detect leaks or tears and to identify when materials need to be removed.
- e) Dispose of materials properly. The preferred method is to allow the water to evaporate and to recycle the hardened concrete. Full service companies may provide dewatering services and should dispose of wastewater properly. Concrete wash water can be highly polluted. It should not be discharged to any surface water, storm sewer system, or allowed to infiltrate into the ground. It should not be discharged to a sanitary sewer system without first receiving written permission from the system operator.

1.2.4 SPILL CONTROL PRACTICES:

In addition to the good housekeeping and material management practices discussed in the previous sections of this plan, the following practices will be followed for spill prevention and cleanup:

- Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be made aware of the procedures and the location of the information and cleanup supplies.
- Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite. Equipment and materials will include but not be limited to brooms, dust pans, mops, rags, gloves, goggles, kitty litter, sand, sawdust, and plastic and metal trash containers specifically for this purpose.
- All spills will be cleaned up immediately after discovery.
- The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with hazardous substance.
- Spills of toxic or hazardous material will be reported to the appropriate State or local government agency, regardless of the size.
- The spill prevention plan will be adjusted to include measures to prevent this type of spill from reoccurring and how to clean up the spill if there is another one. A description of the spill, what caused it, and the cleanup measures will also be included.
- The site superintendent responsible for the day-to-day site operations, will be the spill prevention and cleanup coordinator. He will designate at least three other site personnel who will receive spill prevention and cleanup training. These individuals will each become responsible for a particular phase of prevention and cleanup. The names of responsible spill personnel will be posted in the material storage area and in the office trailer onsite.

EnvirotempTM FR3TM fluid Formulated for performance.



Envirotemp™ FR3™ fluid.
Trusted worldwide
a million times over.





With over one million installations across six continents and validated in over 250 tests, Cargill's Envirotemp™ FR3™ natural ester fluid is trusted by our customers to deliver cost-effective solutions that help improve transformer performance reliably and safely.

Our team of dielectric experts is active in the standards community globally and has extensive knowledge of not only dielectric fluid properties but also fluid performance in

application. And they have transformer design experience, too. This means our customers adopting FR3 natural ester technology have comprehensive dielectric fluids support from initial planning stages through best practices implementation and beyond.

Backed by Cargill's global supply chain network, our customers can rely on us to deliver the best solution for their application - when they need it, anywhere in the world.

With FR3 fluid, our customers can:

- Gain cost efficiencies either on initial cost or total cost of ownership without sacrificing reliability.
- Extend transformer insulation and asset life.
- Optimize load capacity.
- Significantly improve fire safety.
- Enhance their environmental footprint and sustainable supply chain initiatives.

Improve performance with life extension and loading flexibility.

Protect insulation life to extend asset life.

Insulation paper is one of the primary factors that determines the life of a transformer. FR3™ fluid's unique chemistry absorbs free water and essentially wicks it away from the insulation paper. FR3 fluid has 10 times the water saturation level of mineral oil. This results in extending the insulation life 5-8 times longer than mineral oil.



Insulation aging study comparing thermally upgraded paper using FR3 fluid vs. mineral oil.

- Save significantly on replacement costs by extending the asset life with FR3 fluid.
- Reduce the risk of failure to improve reliability of the transformer.
- Reduce processing maintenance costs, since FR3 fluid does not sludge like mineral oil.

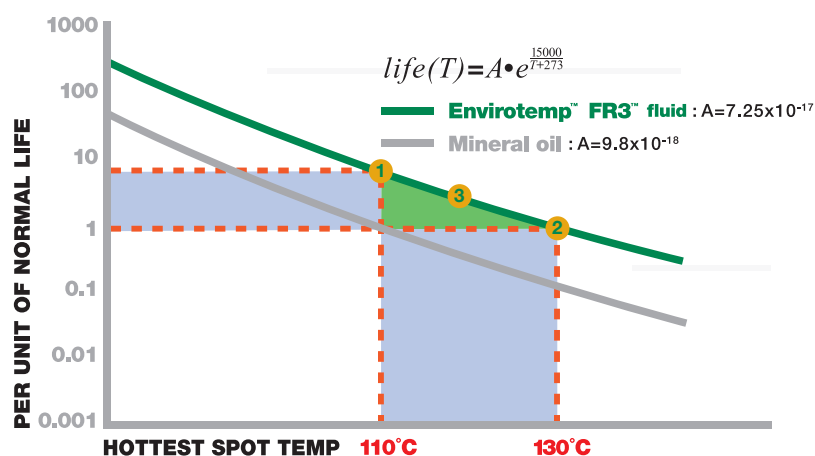
With FR3™ fluid’s unique capabilities to extend insulation life and increase load capacity, organizations now have the flexibility to optimize their transformer fleet loading profiles in order to gain cost savings without sacrificing reliability.

Leverage higher thermal capability with FR3 fluid.

Historically, standards were written to accommodate a 95°C or 110°C hot spot for cellulose and Thermally Upgraded Kraft (TUK), respectively. However, published high temperature insulation system standards - IEC (60076-14) and IEEE (C157.154) – accommodate a 15°C or 20°C increase in hot spot without sacrificing the life or reliability of the transformer, when immersed in natural ester fluid.

Paper	Dielectric Fluid	Thermal Class	Hot spot	IEEE AWR	IEC AWR
TUK	Mineral Oil	120	110°C	65°C	75K
TUK	Natural Ester	140	130°C	85°C	95K

TUK life curves



- OPTION 1:** Extend asset life at current 110° hotspot.
- OPTION 2:** Increase load capability up to 20% with 130°C hotspot.
- OPTION 3:** Incrementally extend asset life and increase load capability with 120°C hotspot.

IEC 60076-14 Part 14: Liquid-immersed power transformers using high-temperature insulation materials. Edition 1.0 September 2013.
 IEEE C57.154 Standard for the Design, Testing, and Application of Liquid-Immersed Distribution, Power, and Regulating Transformers Using High-Temperature Insulation Systems and Operating at Elevated Temperature. Published October 30, 2012.

Improve fire safety.

Add more sustainability to your sustainable supply chain.



Reduce costs while increasing fire safety.

FR3™ fluid has the highest fire point of any dielectric fluid (360°C compared to 160°C for mineral oil) making it the ideal choice for densely populated areas where transformers are positioned indoors, underground or in close proximity to buildings and other equipment. FR3 fluid is a K-class, less flammable fluid as certified by Underwriters Laboratory and approved by FM Global.

- Reduce clearance to buildings which saves precious real estate, particularly in space-constrained areas.
- Retrofill older transformers with FR3 fluid instead of replacing or moving them to help comply with current fire code regulations.
- For power transformers, potentially eliminate the need for expensive fire walls and deluge systems (and their ongoing maintenance costs).



“Being green” also benefits your bottom line.

FR3 fluid not only has best-in-class environmental properties, but with its enhanced thermal capabilities enabling smaller transformer designs, your supply chain just got a whole lot more sustainable.

- Smaller, more efficient transformer designs:
 1. Use less fluid and construction materials.
 2. Are typically lighter which could make installations easier for work crews and could reduce transportation costs.

Envirotemp™ FR3™ fluid properties: standard acceptance values and typical values

PROPERTY	Standard test methods		ASTM D6871	IEC 62770	Envirotemp FR3 fluid
	ASTM	ISO/IEC	As-received new fluid property requirements	Unused new fluid property requirements	TYPICAL
Physical					
Color	D1500	ISO 2211	≤1.0		0.5
Flash Point PMCC (°C)	D93	ISO 2719		≥250	255
Flash Point COC (°C)	D92	ISO 2592	≥275		320-330
Fire Point (°C)	D92	ISO 2592	≥300	>300	350-360
Pour Point (°C)	D97	ISO 3016	<-10	≤-10	-18 - -23
Density at 20°C (g/cm³)		ISO 3675		≤1.0	0.92
Relative Density (Specific Gravity) 15°C	D1298		≤0.96		0.92
Viscosity (mm²/sec)	D445	ISO 3104			
			≤15	≤15	7.7 - 8.3
			≤50	≤50	32 - 34
			≤500		190
Visual Examination	D1524	IEC 61099 9.2	bright and clear	clear, free from sediment and suspended matter	clear, light green
Biodegradation		OECD 301	readily biodegradable	readily biodegradable	ultimately biodegradable
Electrical					
Dielectric Breakdown (kV)	D877		≥30		47
Dielectric Breakdown (kV)					
	1mm gap	D1816	≥20		28
	2mm gap	D1816	≥35		48-75
	2.5mm gap			≥35	73
Gassing Tendency (mm/min)	D2300	IEC 60156	≤0		-79
Dissipation Factor					
	25°C (%)	D924	≤0.20		0.010 - 0.15
	90°C (tan δ)			≤0.05	0.02
	100°C (%)	D924	≤4.0		0.41 - 3.85
Chemical					
Corrosive Sulfur	D1275	IEC 62697	non-corrosive	non-corrosive	non-corrosive
Water Content (mg/kg)	D1533	IEC 60814	≤200	≤200	4 - 50
Acid Number (mg KOH/g)	D974	IEC 62021.3	≤0.06	≤0.06	0.013 - 0.042
PCB Content (mg/kg)	D4059	IEC 61619	not detectable	free from PCBs	not detectable
Oxidation Stability (48 hrs, 120°C)		IEC 61125C			
	Total Acidity (mg KOH/g)			≤0.6	0.1
	Viscosity at 40°C (mm²/sec)	ISO 3104		≤30% increase over initial	17.1% increase
	Dissipation Factor at 90°C (tan δ)	IEC 60247		≤0.5	0.1

NOTE: Specifications should be written referencing only the defined ASTM or IEC industry standard acceptance values and test methods. The listed 'typical' values are average values summarized from a significant number of data points over many years; they are not to be identified as acceptance values.

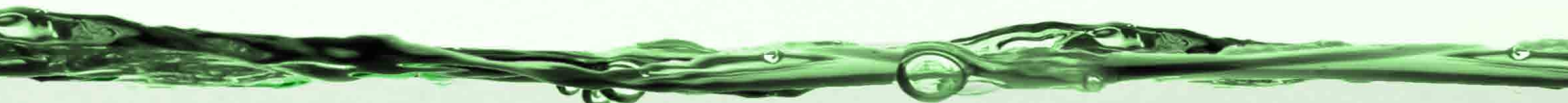
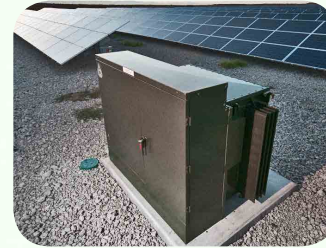
ASTM D6871 Standard Specification for Natural (Vegetable Oil) Ester Fluids Used in Electrical Apparatus.

IEC 62770: Fluids for electrotechnical applications – Unused natural esters liquids for transformers and similar electrical equipment.

A transformer filled with FR3™ fluid complies with the transformer temperature operating range requirements defined in IEEE C57.12.00 and IEC 60076-1.

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- Made from a renewable source with global, reliable supply.
- Carbon neutral (according to BEES 4.0 lifecycle analysis).
- Non-toxic and non-hazardous in soil and water.
- Biodegrades in less than 28 days.
- Contains no petroleum, halogens, silicones or sulfurs.
- Recyclable.



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